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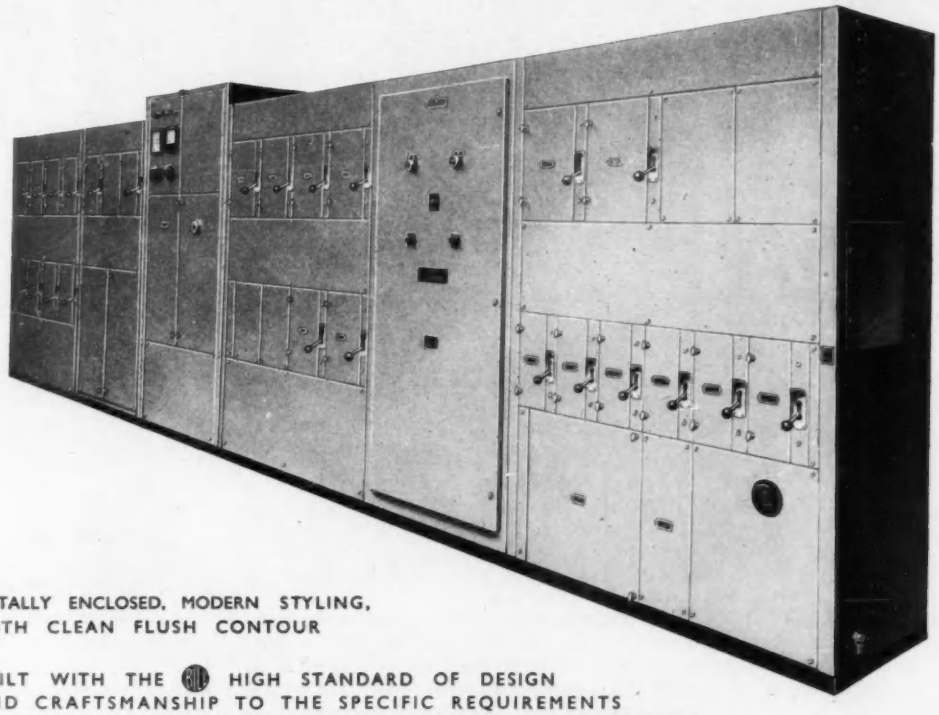

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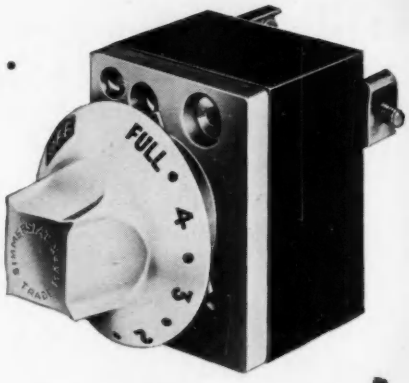

the NEW

'Simmerstat'

Regulator TYPE TYX/B

This new 'Simmerstat' is even smaller. It fits comfortably into any cooker switch chamber and can easily replace multi-heat switches since it uses the same fixing holes. Housewives appreciate the 'Simmerstat' with its smooth finger-tip control of hotplates from slow simmer to fast boil—and the fact that it reduces electricity consumption by as much as 50%. 'Simmerstats' for grill and grill-boiler control are increasingly popular.

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Full specification in Technical Publication 3041 from:
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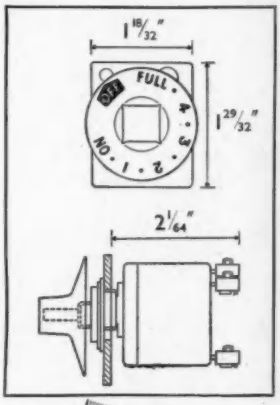
Tel: Harlow 25271.



✳ *For the Few* housewives who still do not know about the 'Simmerstat', there is an attractive consumer leaflet. Supplies on request.

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B T-H

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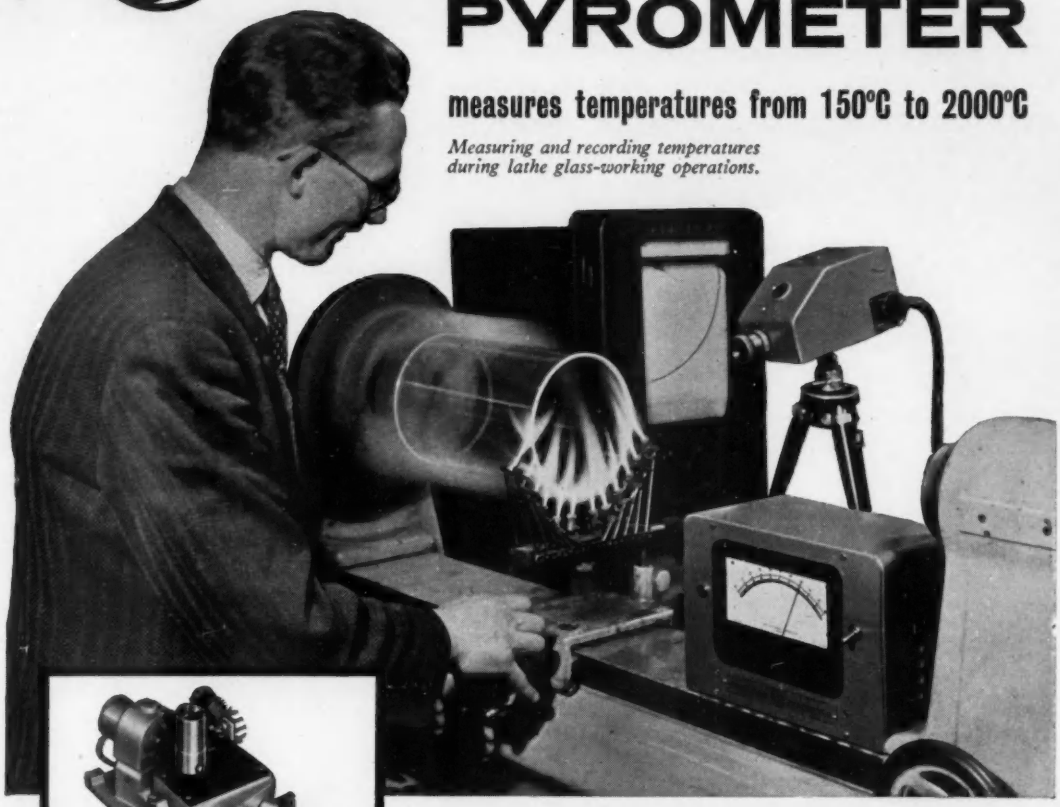
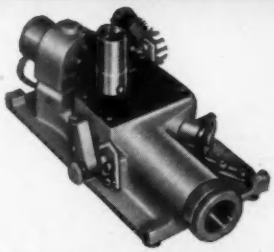
PYROMETER

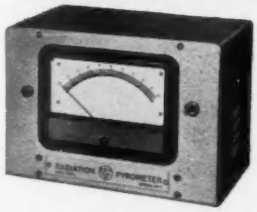
measures temperatures from 150°C to 2000°C

Measuring and recording temperatures during lathe glass-working operations.





Viewing head of BTH Infra-red pyrometer, cover removed.



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This versatile instrument provides a ready means of ascertaining the temperature of stationary or moving objects by measuring the intensity of infra-red radiation emitted from a surface, the viewing area of which can be as little as 0.4 in. diameter.

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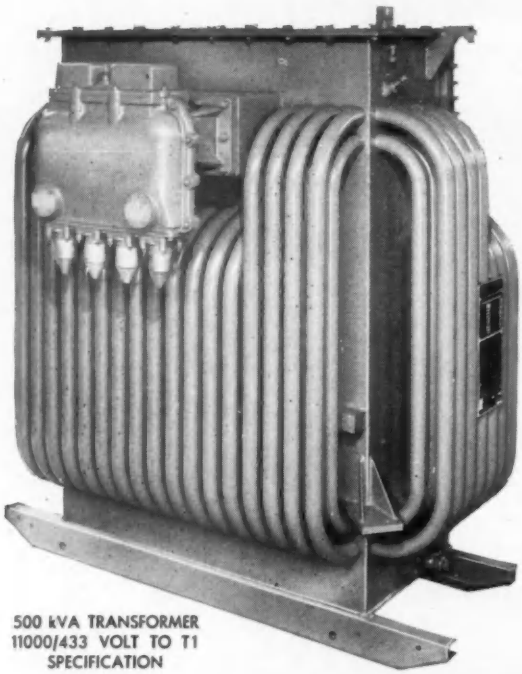
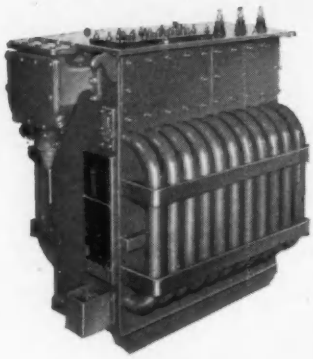


500 kVA TRANSFORMER 11000/433 VOLT TO T1 SPECIFICATION



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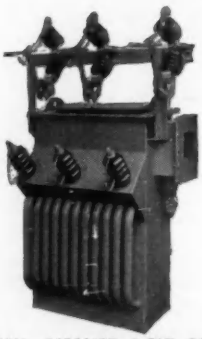

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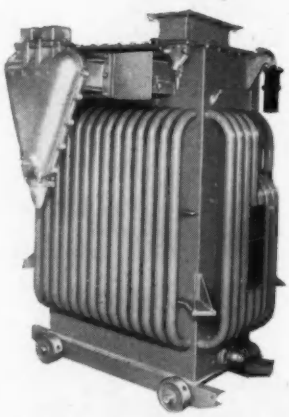

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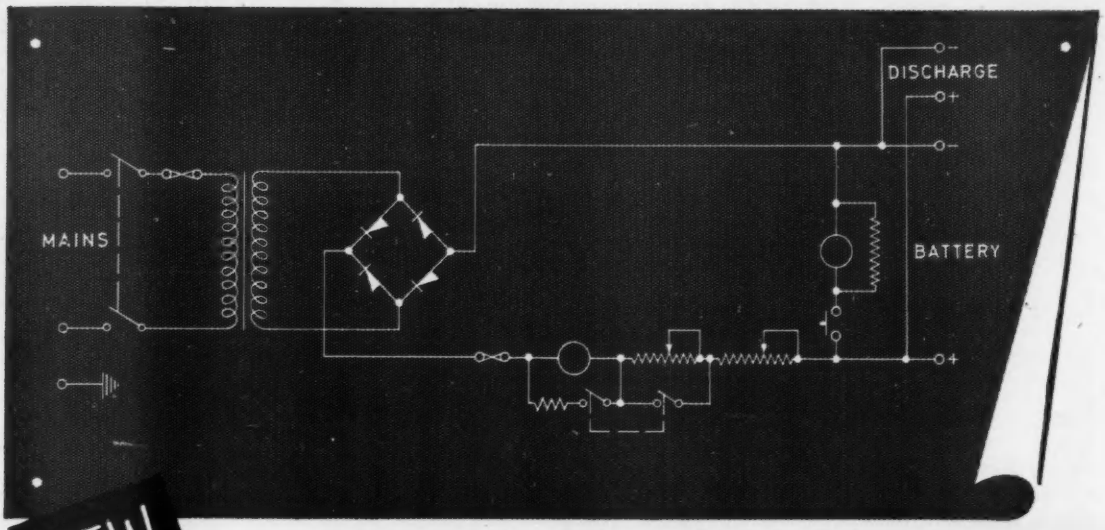

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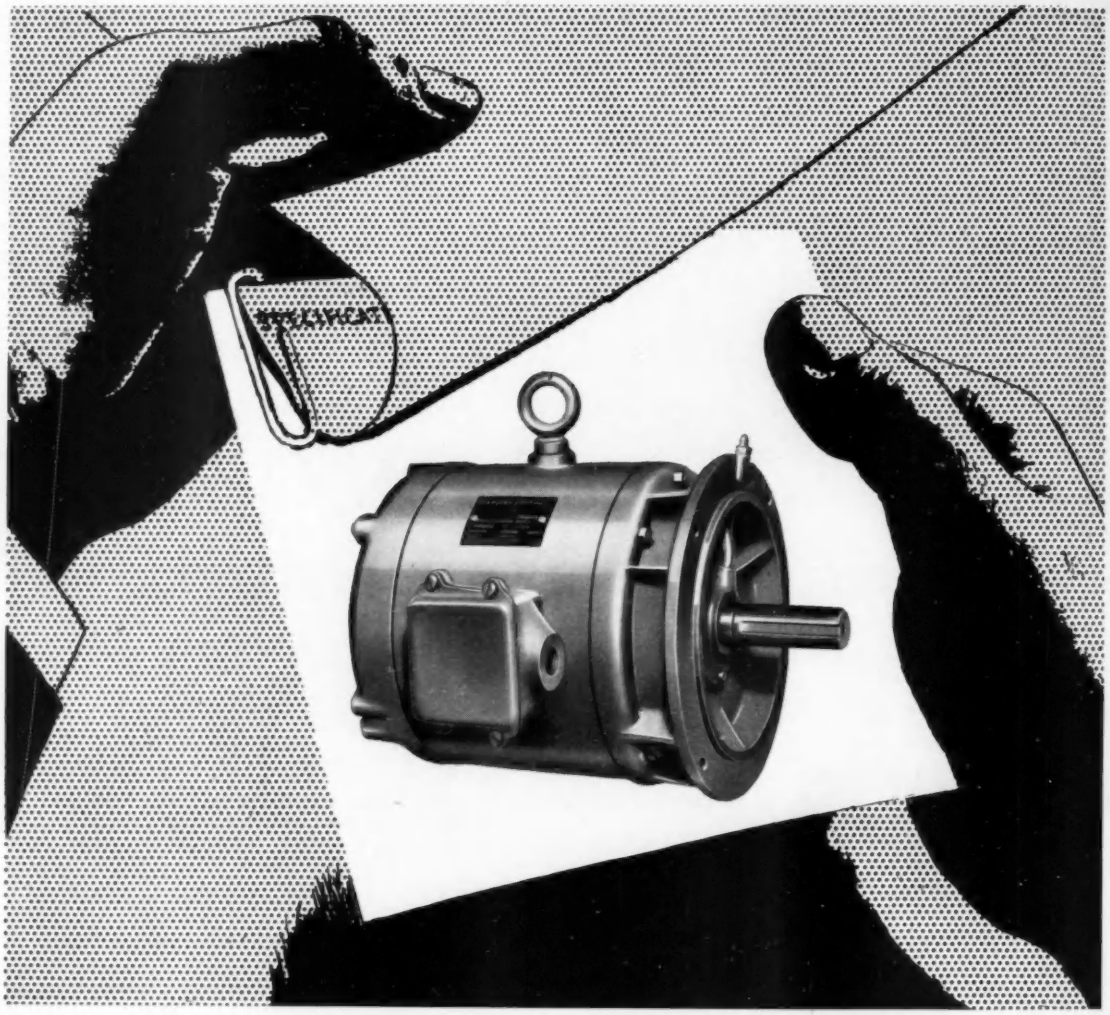

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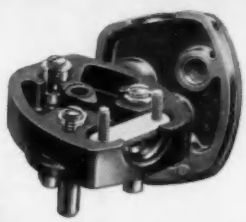

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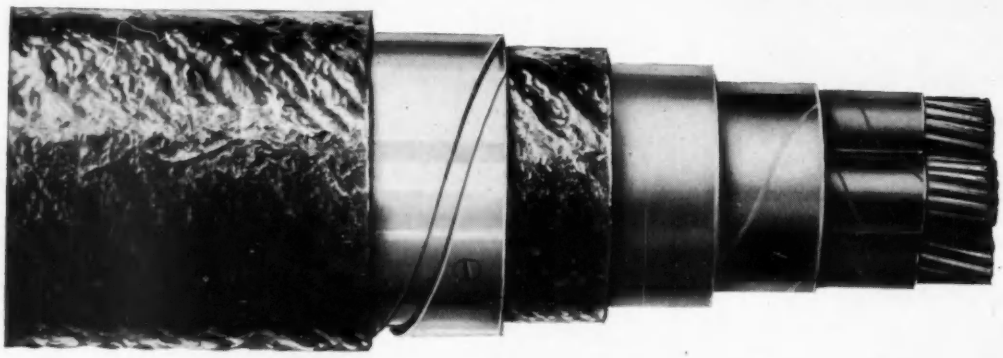

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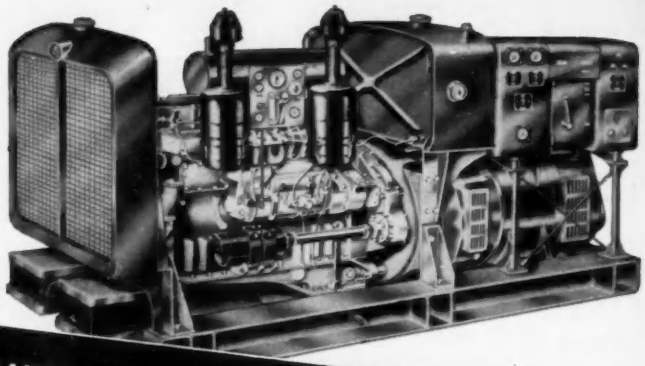

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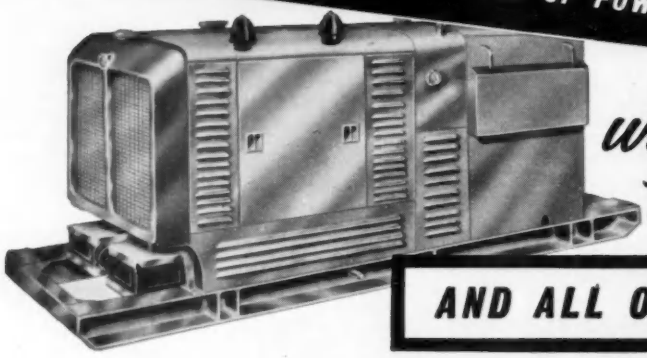

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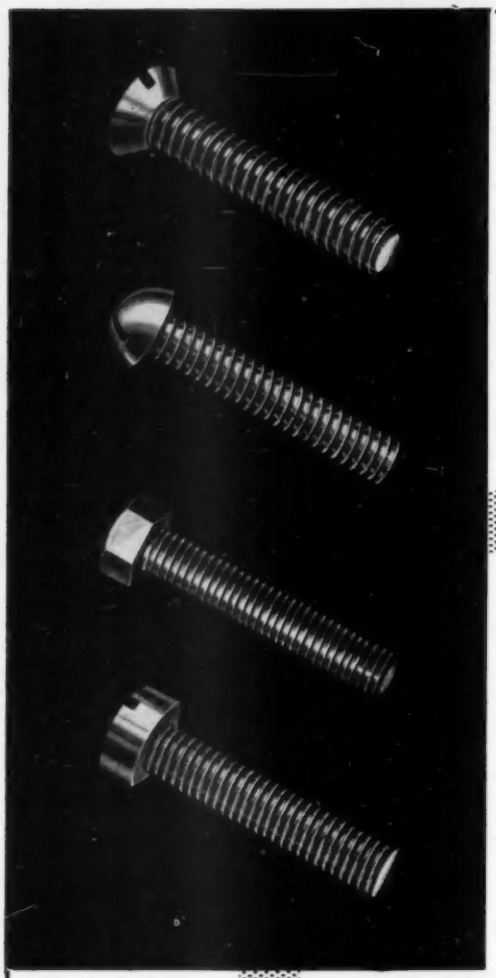

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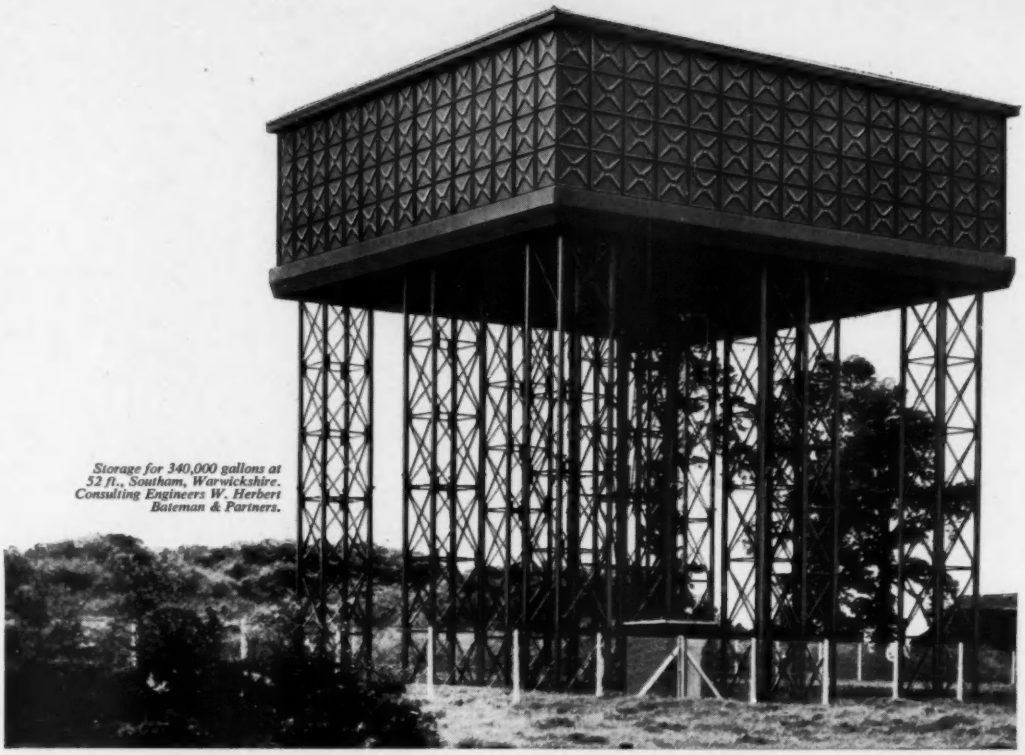
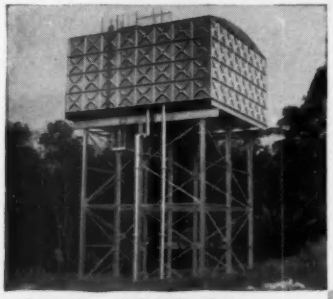


Storage for 340,000 gallons at 52 ft., Southam, Warwickshire. Consulting Engineers W. Herbert Bateman & Partners.



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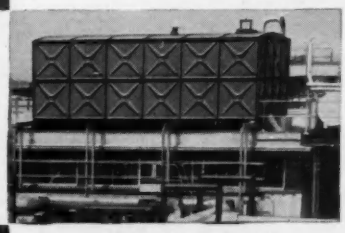
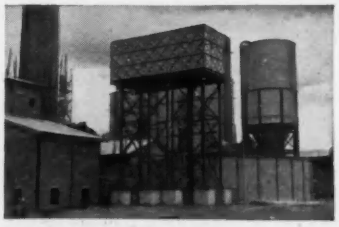


Supported on steel grillages, one of many covered tanks erected at a power station near London. Consulting Engineers Merz & McLellan.



Industrial development, Malaya. Water storage tank at the new works of Malayan Cement Ltd.

Storage tank for softened water at the Isle of Grain Oil Refinery. (Photograph courtesy Tothill Press Ltd).

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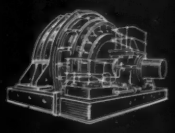

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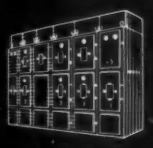
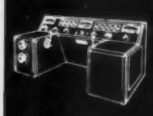
MOTORS
Type MDX motor



SWITCHGEAR
Type AIR Switchboards

PLANT
Mercury Arc Rectifiers

WELDING
Paradyne arc Welding sets



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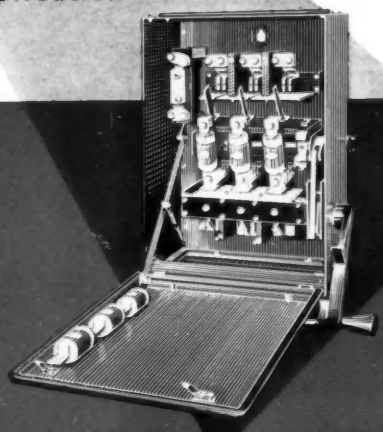

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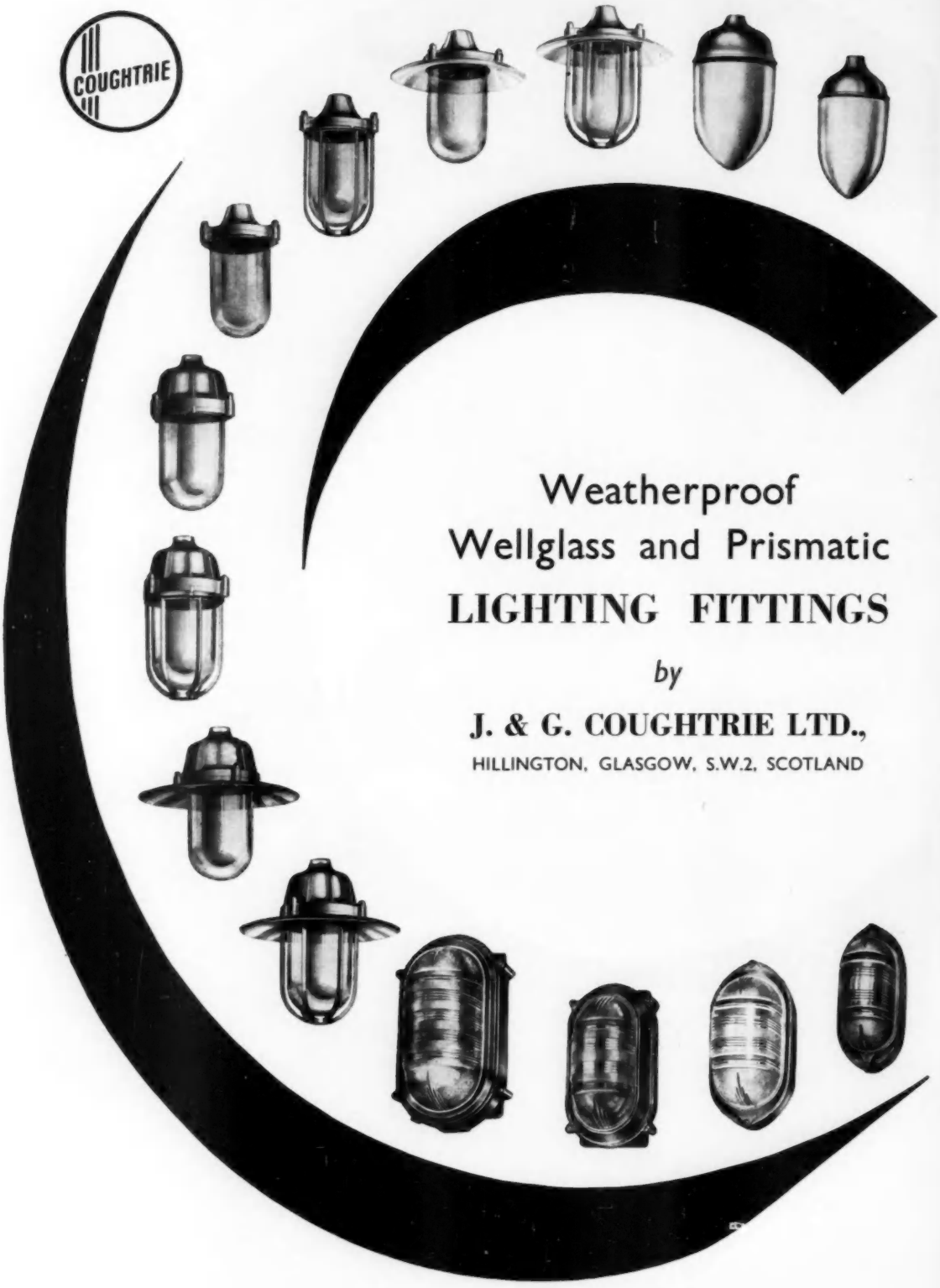

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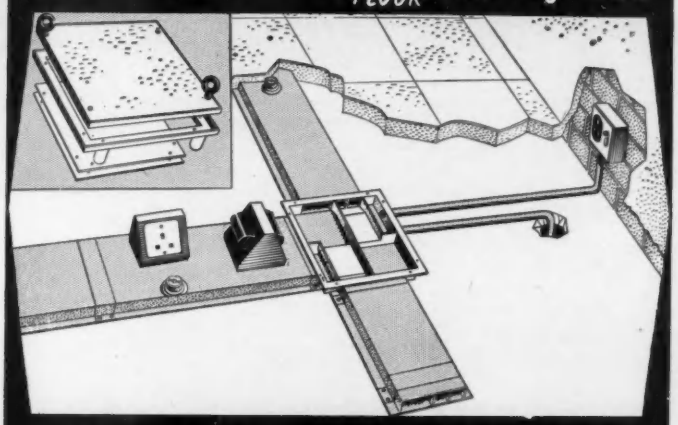

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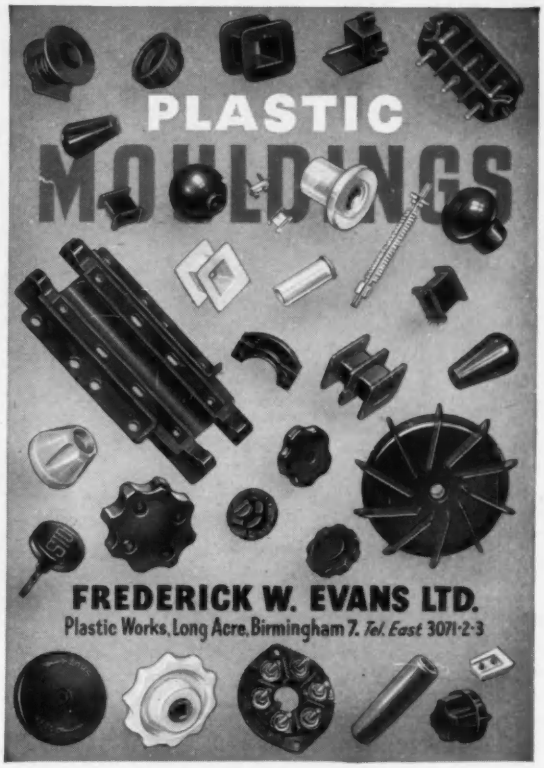

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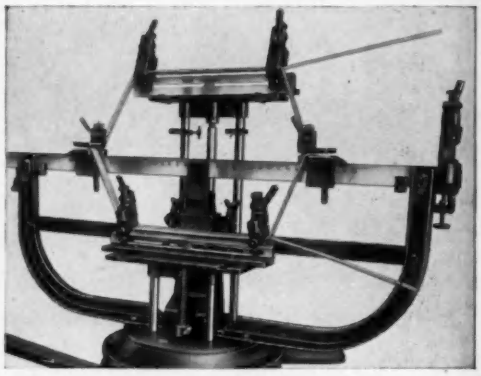

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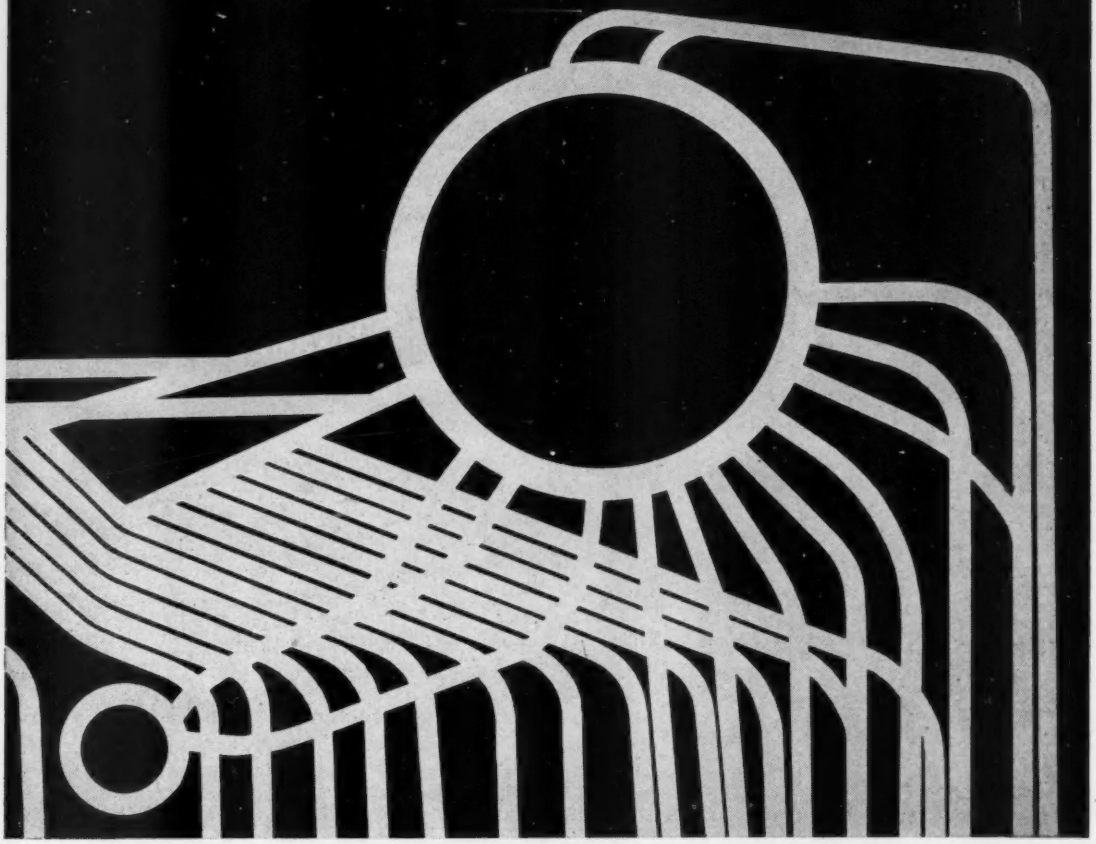

We build water-tube boilers for outputs between 20,000 and 1,000,000 lb. per hour at steam conditions up to 2,350 p.s.i.g., 1,050°F, with or without re-heat, fired by liquid, solid or gaseous fuel. They are generously designed to maintain high efficiency over prolonged steaming periods.

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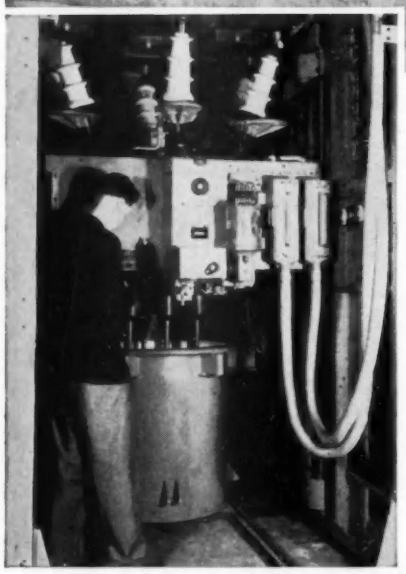

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Above: Seven-panel switchboard on a restricted site in South Wales.

Left: Single unit with tank lowered and breaker in isolated position.

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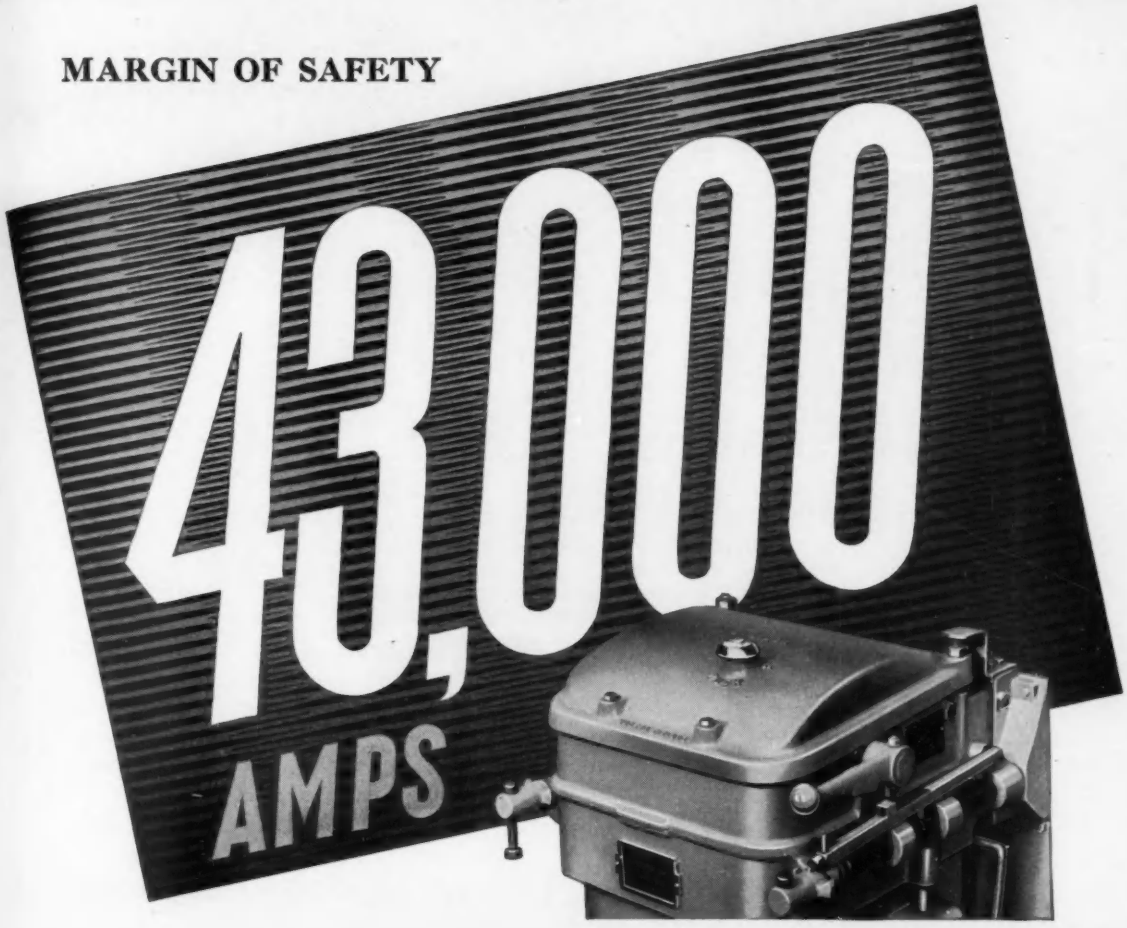

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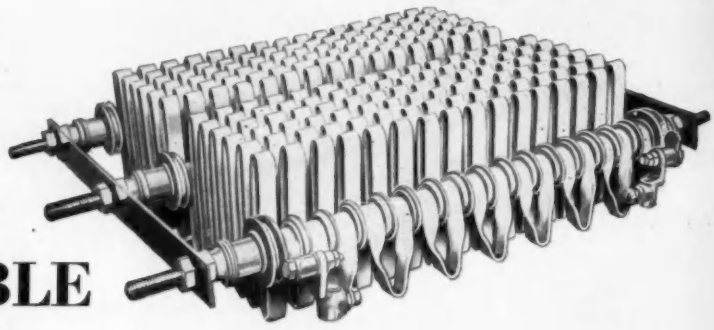

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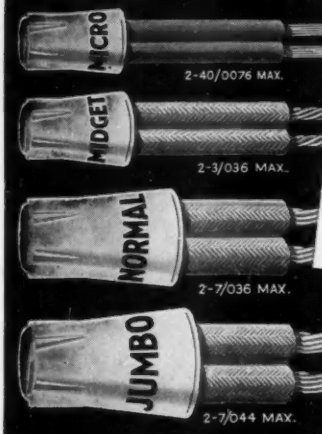

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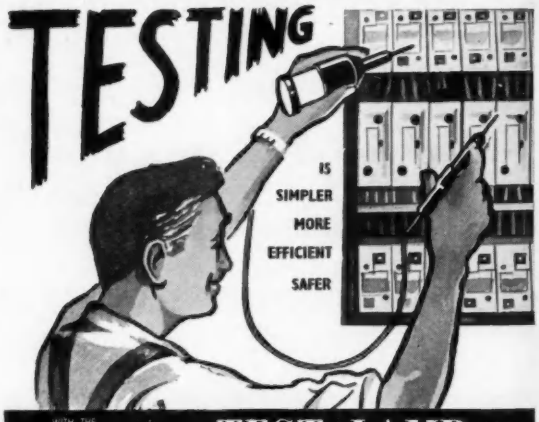

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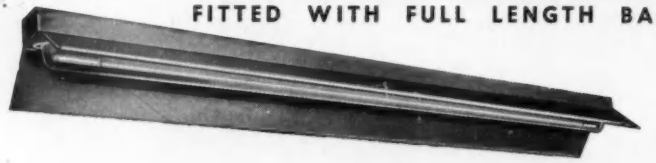

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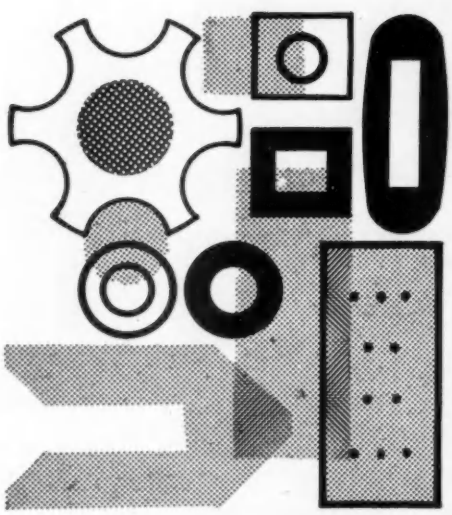

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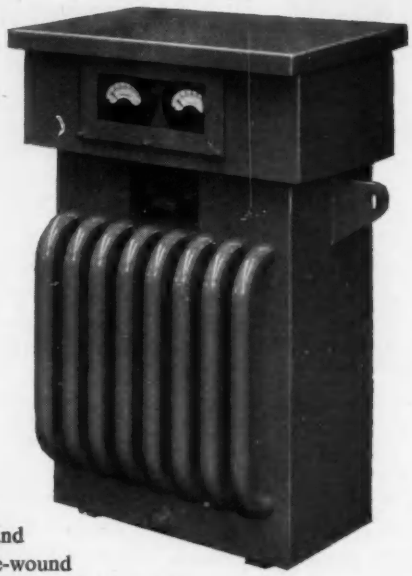

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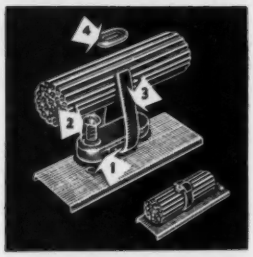

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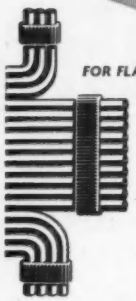

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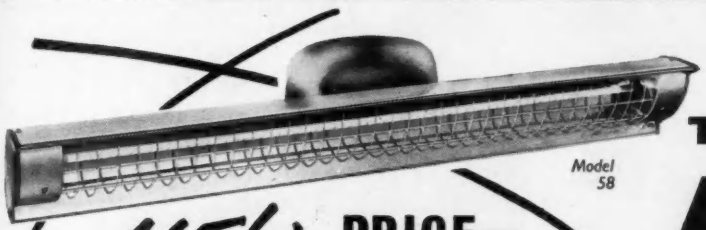

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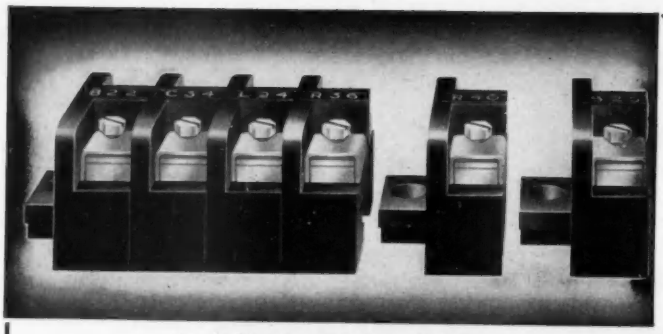

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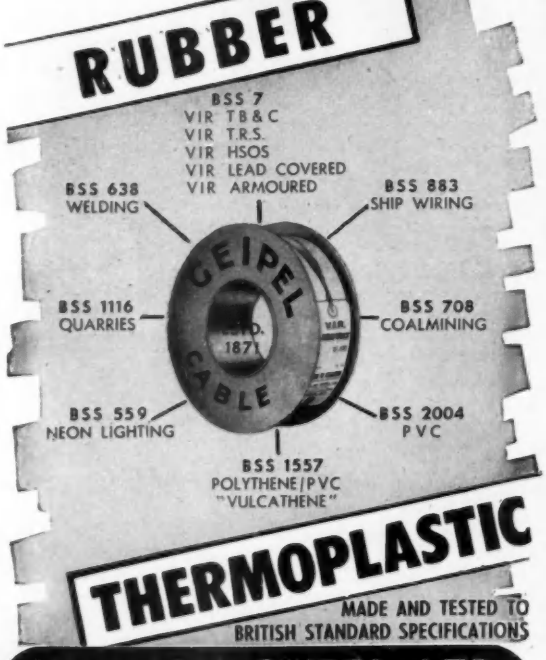

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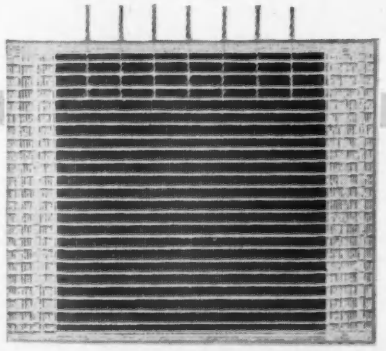

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Taking a leaf out of the Wiggin book

Swiss domestic electrical equipment

Switzerland is a small and highly industrialized country without any indigenous coal or oil, but endowed with abundant water power. Electricity is thus the chief source of energy, with the result that a large and thriving electrical industry has grown up. By virtue of their consistent success in making and exporting a wide range of quality products, the Swiss people enjoy excellent living standards and make wide use in their homes of electrical equipment designed to promote domestic comfort. Although this equipment is Swiss made, it commonly contains specialized materials imported from Great Britain. In the following pages are shown a few of the many Swiss domestic appliances which embody heating elements of 'Brightray' nickel-chromium alloys produced by Henry Wiggin and Company Limited and distributed in Switzerland by their agents, Nickel-Contor of Gotthardstrasse 21, Zurich 2/22.

Among the range of industrial and domestic electrical equipment made by MAXIM A.G., of Aarau, is an infra-red radiation heater designed for wall mounting in bathrooms, kitchens, children's nurseries and so forth. The reflector is a bright aluminium pressing and the elements are of the tubular sheathed type with spirals of Brightray C resistance wire encased in mineral insulation within the sheath. Rated at 1 kW, the heater can be supplied for operation at various voltages up to 380 and measures about 14 in. × 6¼ in.

Water distillation units of both the semi- and fully-automatic type with outputs from 2 to 20 litres per hour are included in the products of TROTTEREM A.G., of Biasca. The fully-automatic model includes a storage tank of 100–300 litres capacity, containing a liquid level measuring device coupled to the distillation unit; as distilled water is drawn off, the storage tank is automatically replenished. Sheathed heating elements with Brightray C wire spirals are standard, with outputs from 1 to 6 kW and for voltages of either 220 or 380.

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Articles dealing with engineering developments in many fields appear regularly in 'Wiggin Nickel Alloys'. Topics discussed here can spark off ideas for a new approach to your own problems of extreme temperatures, corrosion, oxidation, mechanical stress, or electrical resistance.

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TCA 84

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Taking a leaf out of the Wiggin book

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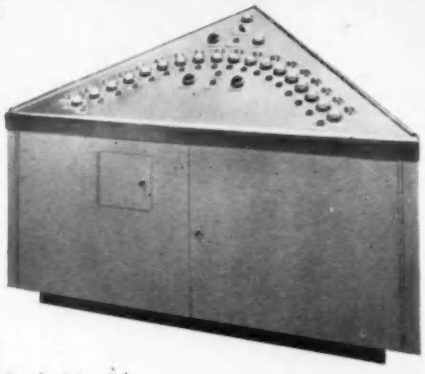

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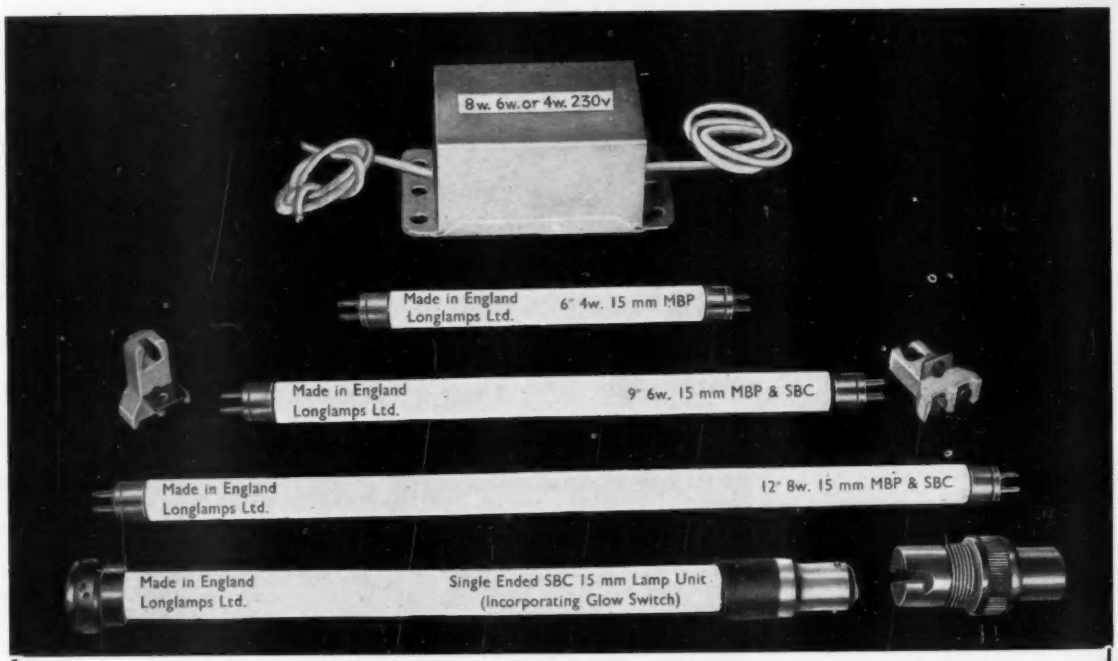
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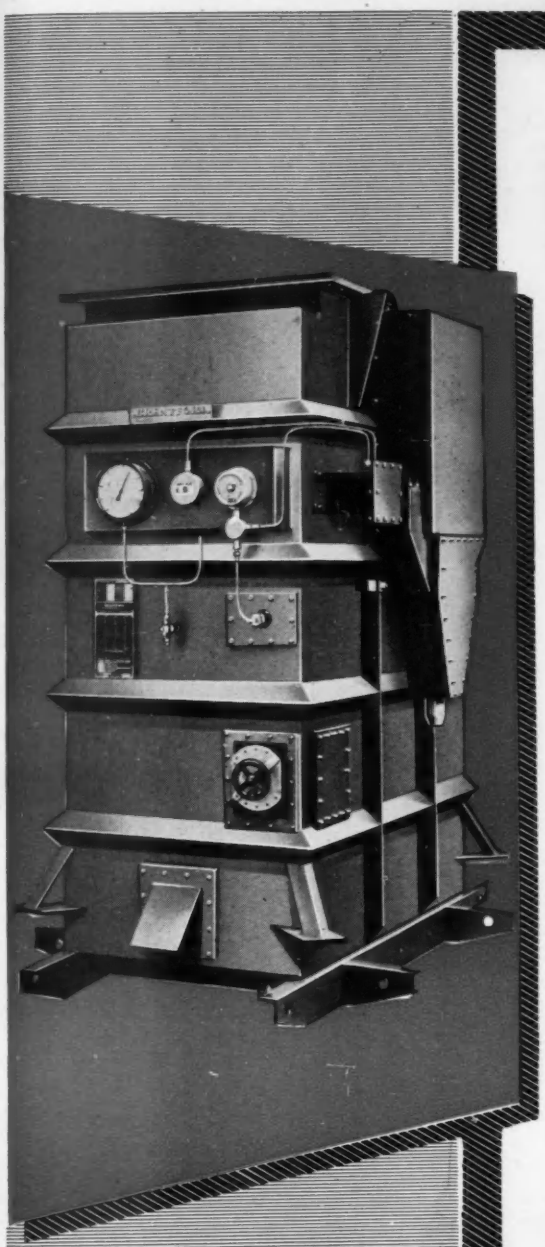

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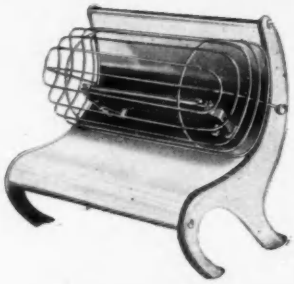

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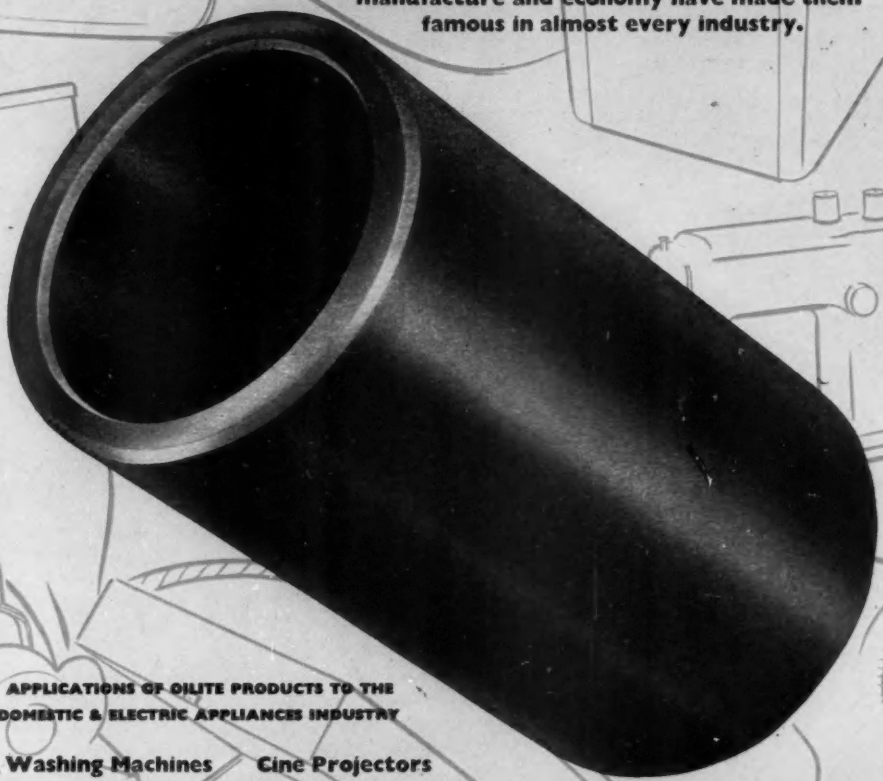

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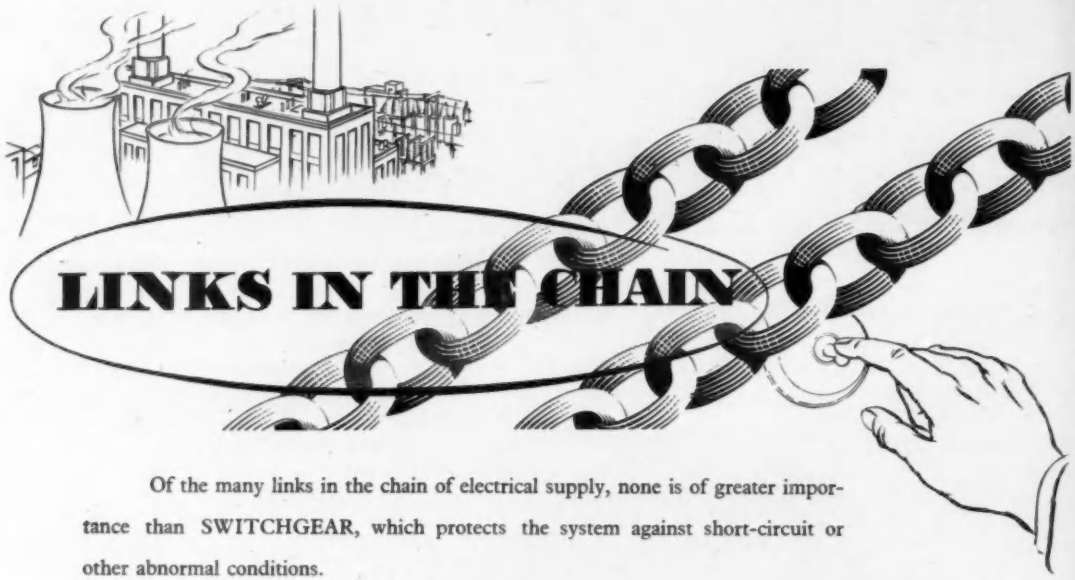

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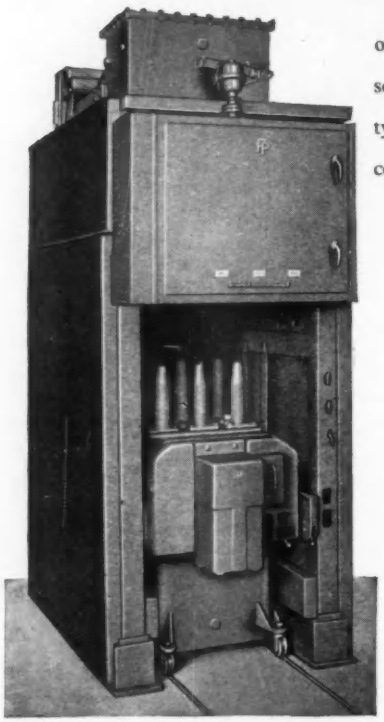

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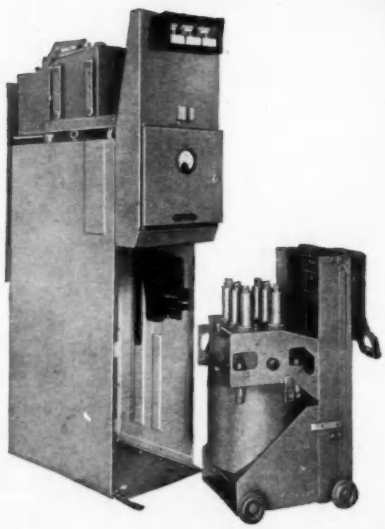

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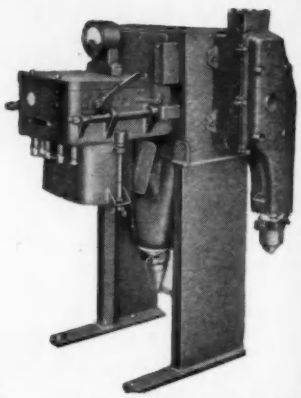

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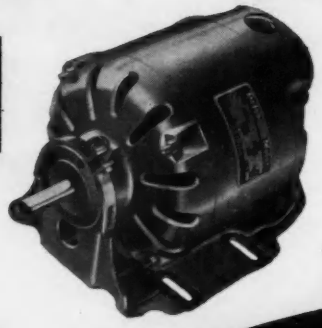

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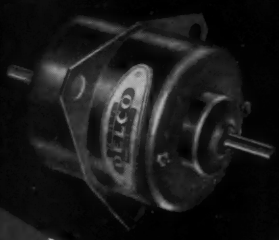

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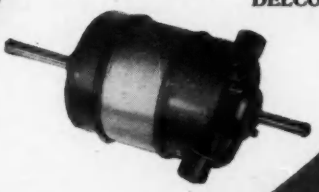

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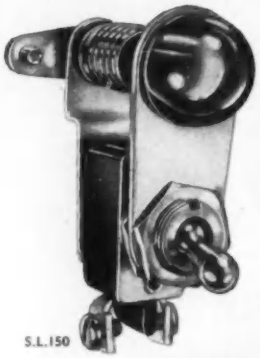
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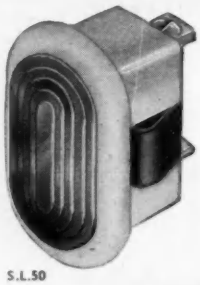
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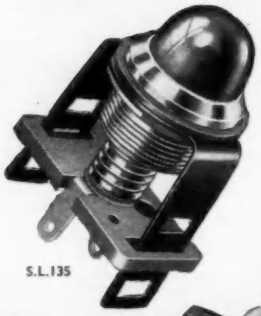
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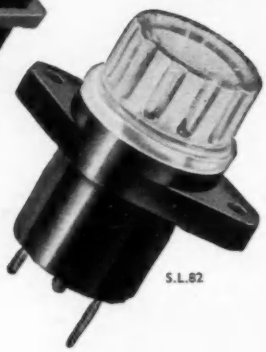
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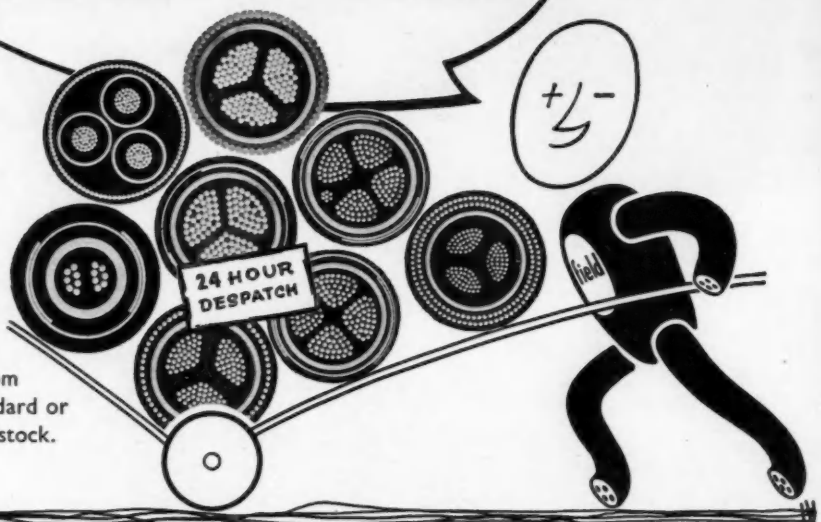

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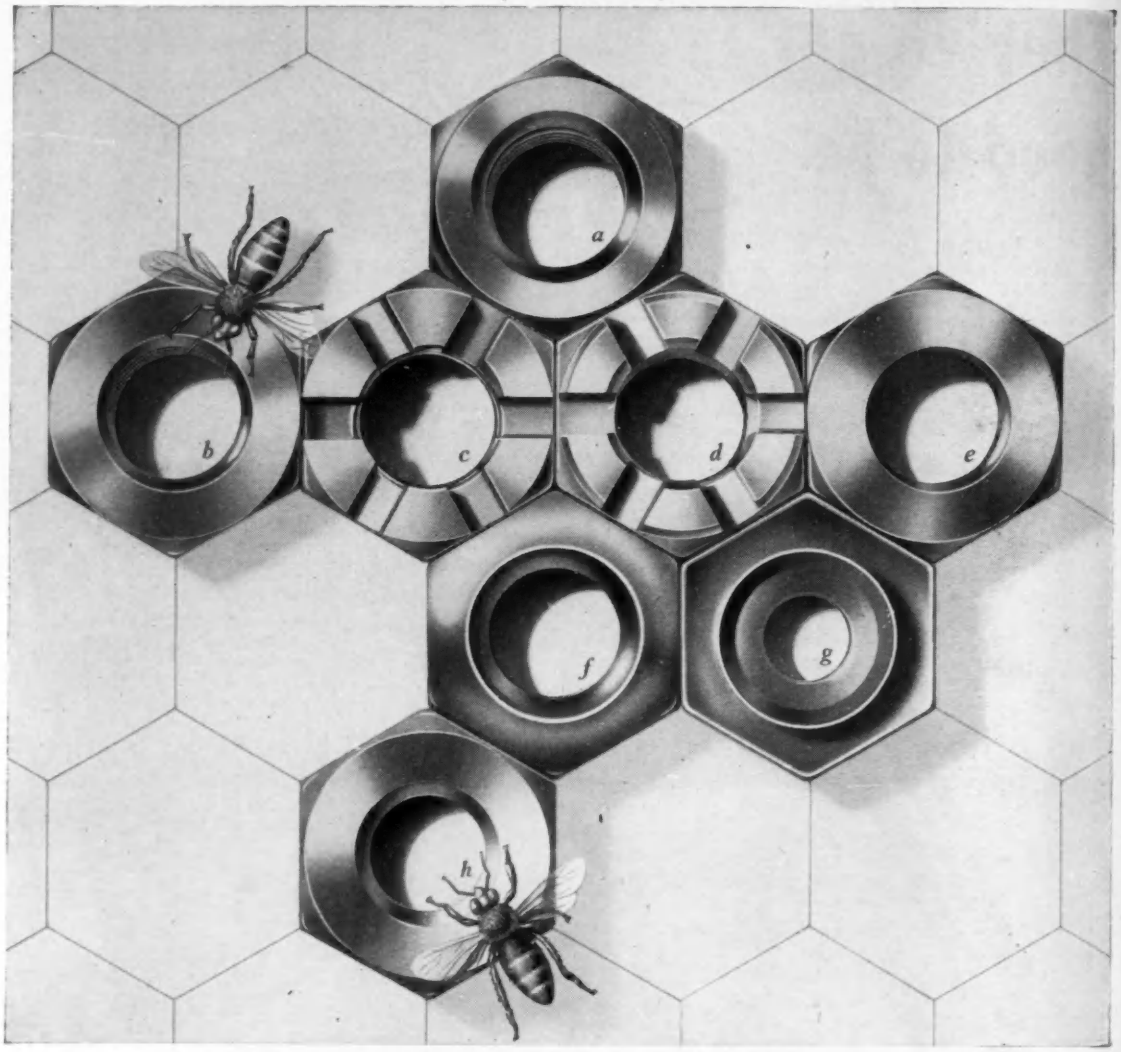

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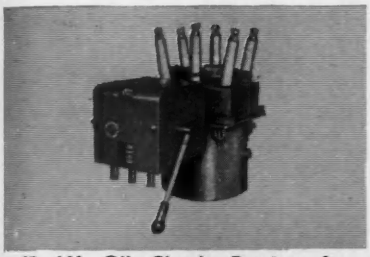
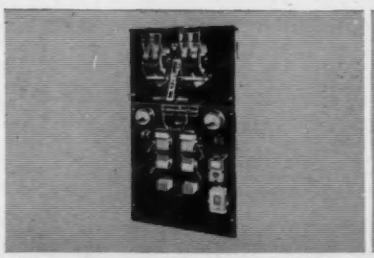
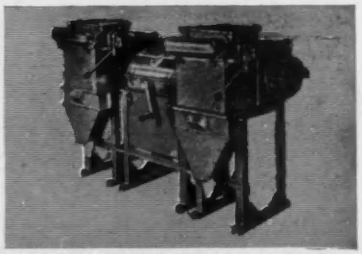


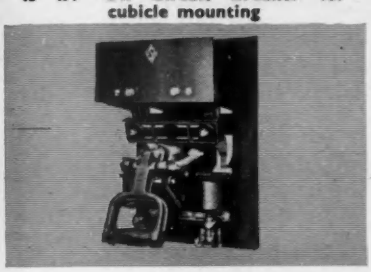
15 kV Oil Circuit Breaker for cubicle mounting



Heavy Current D.C. Circuit Breaker and Knife Switch Panel

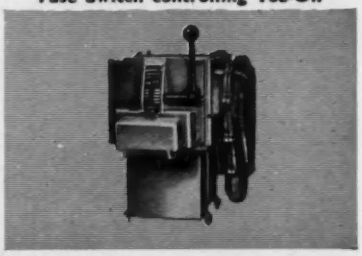


H.V. Ring Main Switchboard with Fuse Switch controlling Tee-Off

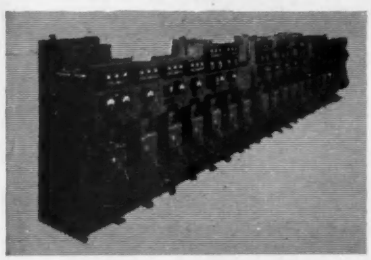


Small Air Circuit Breaker

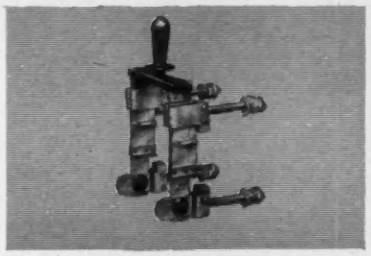
Ammeter and Voltmeter Switches



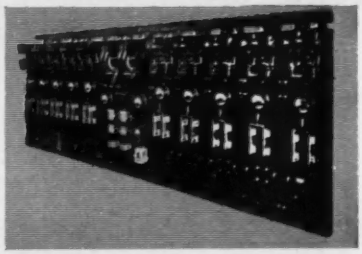
L.V. Industrial Oil Circuit Breaker



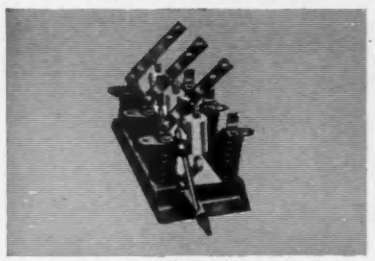
11 kV Metalclad Switchboard



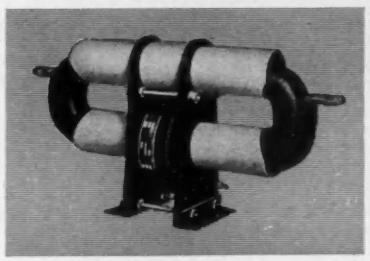
Panel Mounting Knife Switch



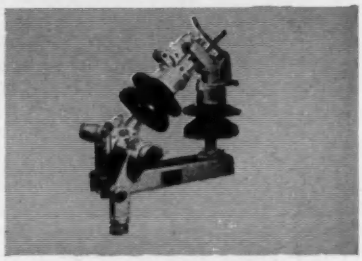
D.C. Switchboard for Steel Works



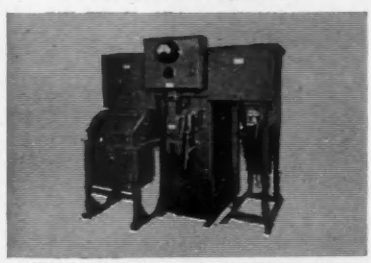
T.P. 11 kV Isolating Switch



Current Transformers



Outdoor Pole Mounting Isolators



H.V. Switchboard incorporating Automatic Fuse Switch

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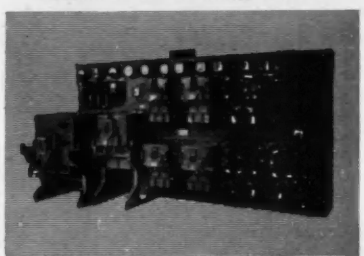

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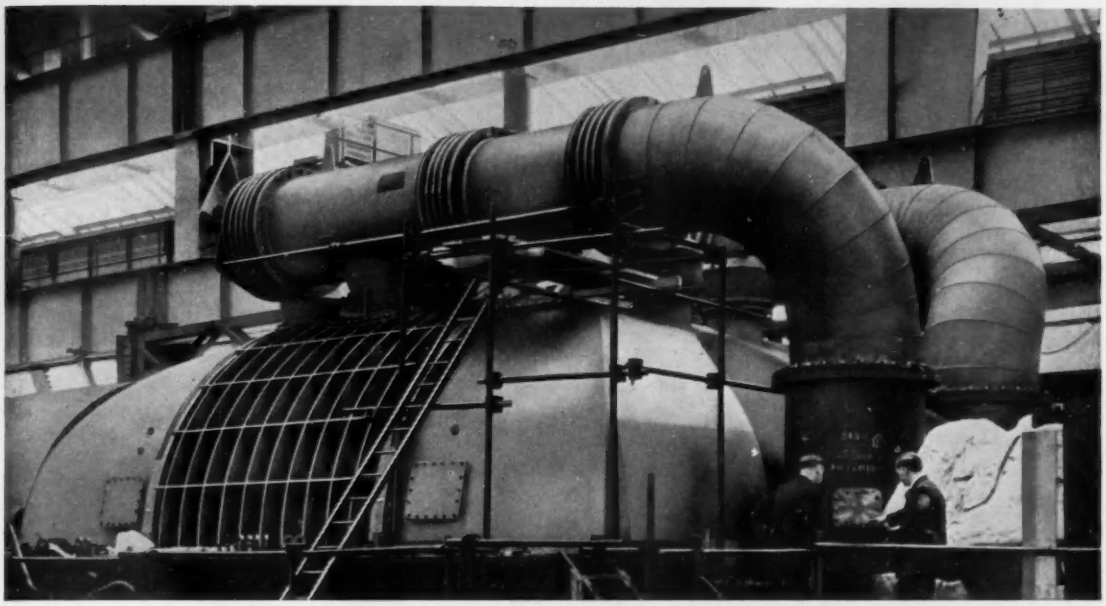

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the first 200 MW for Canada nears completion . . .

There are four of these 200 MW cross compound turbo-generators to be supplied to Canada for installation in the Hydro Electric Power Commission of Ontario, Richard L. Hearn generating station at Toronto. The first of these four machines is now nearing completion. They will be part of the largest power station in the world to install *all Parsons turbo-generators*—a total of four 100 MW sets and these four 200 MW sets.

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. . . as preparations go ahead to build the first 300 MW

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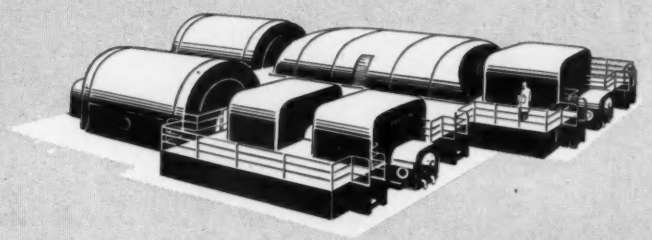

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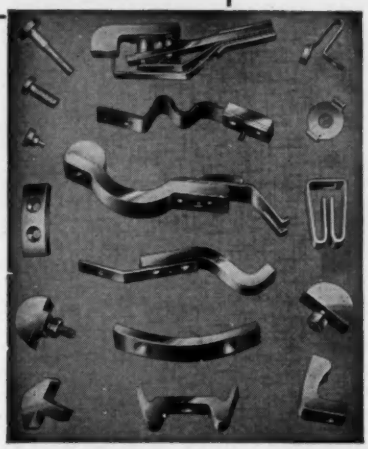

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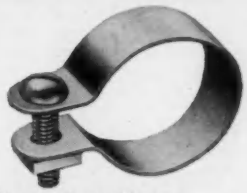
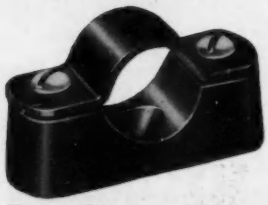


Copper Earth Clip — for pipes ½" to 2" diameter.



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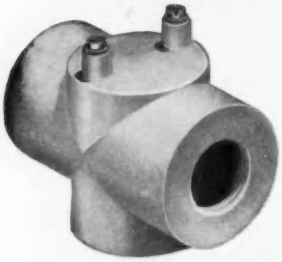

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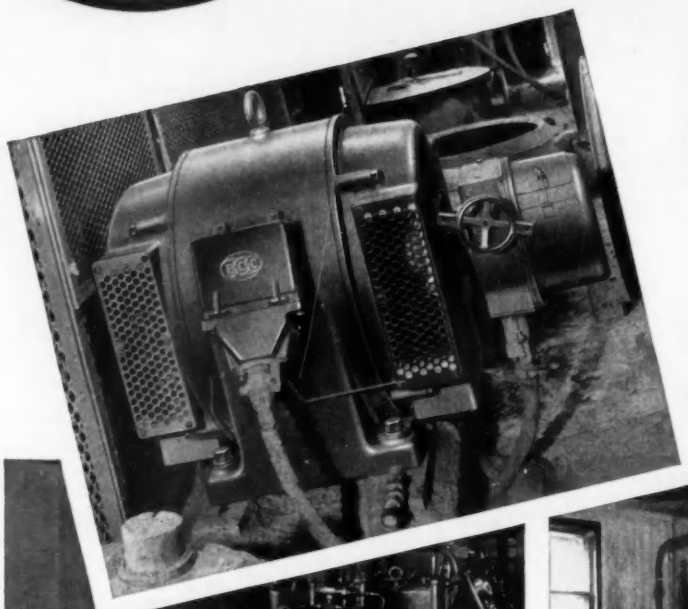

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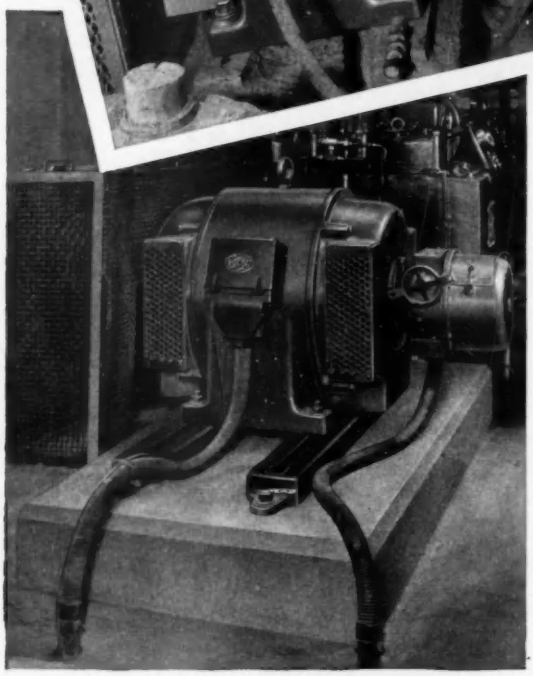

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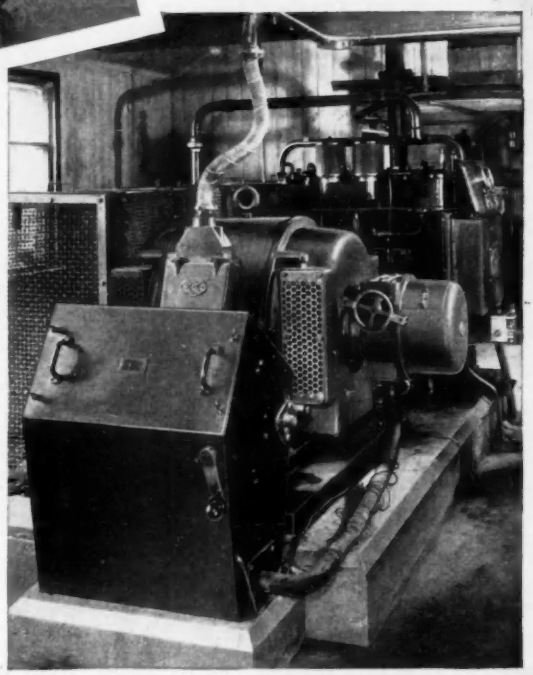

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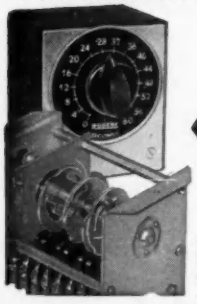

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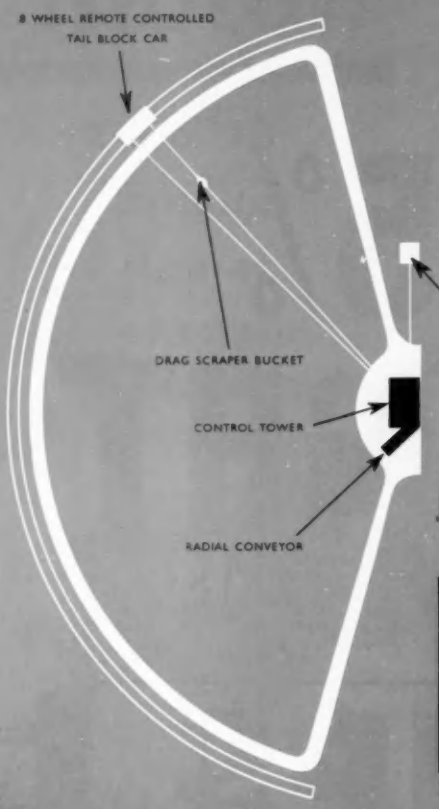

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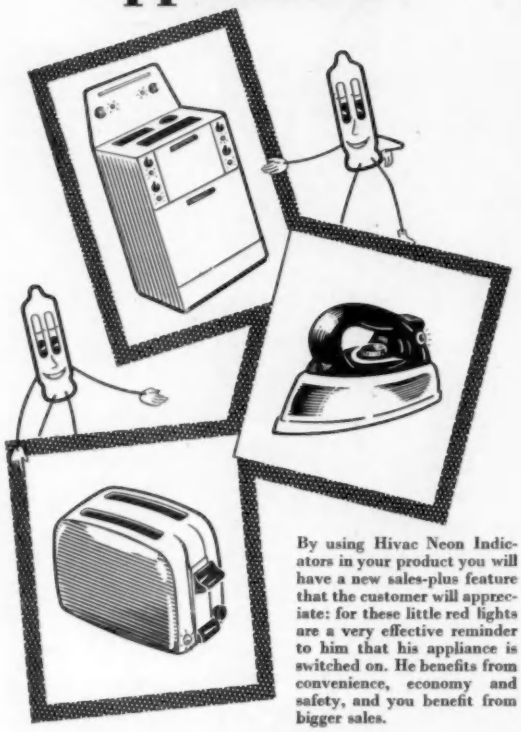

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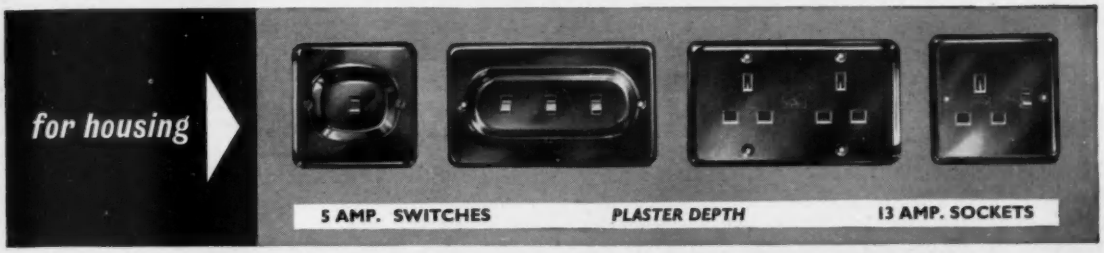

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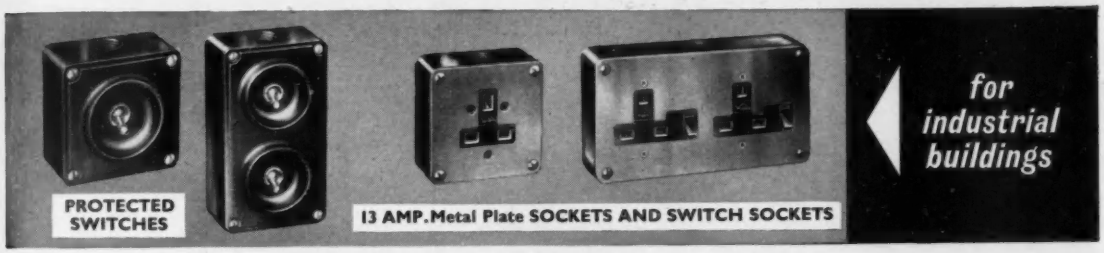

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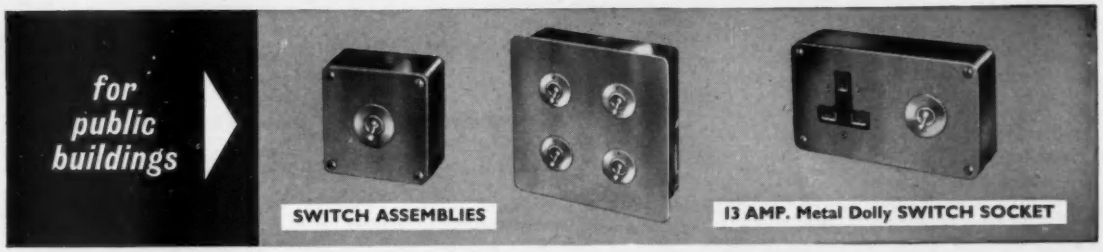

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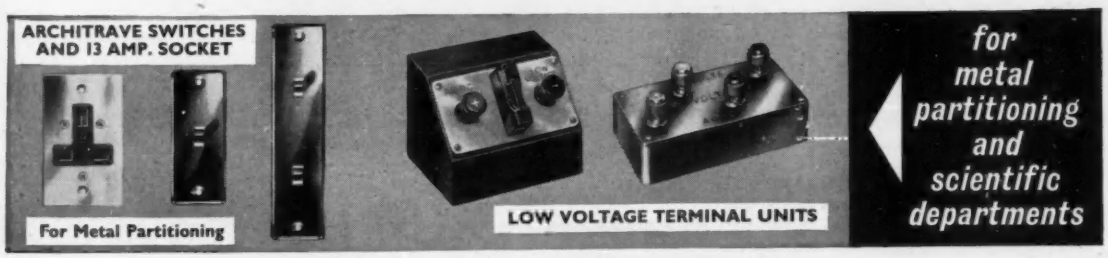
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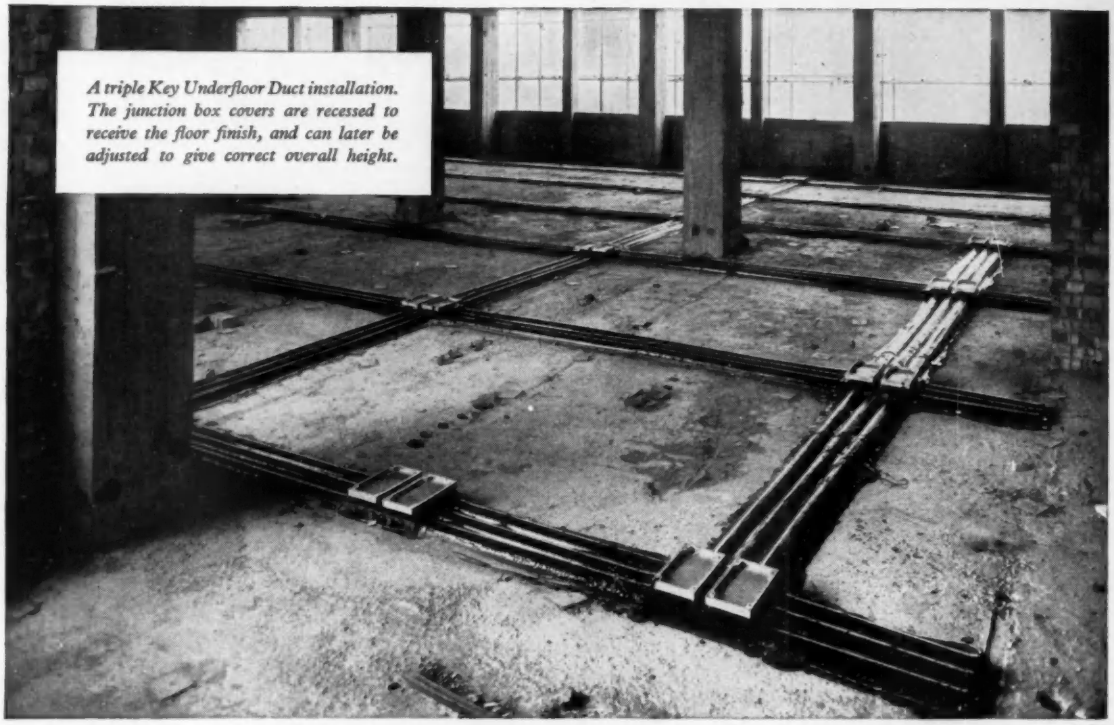

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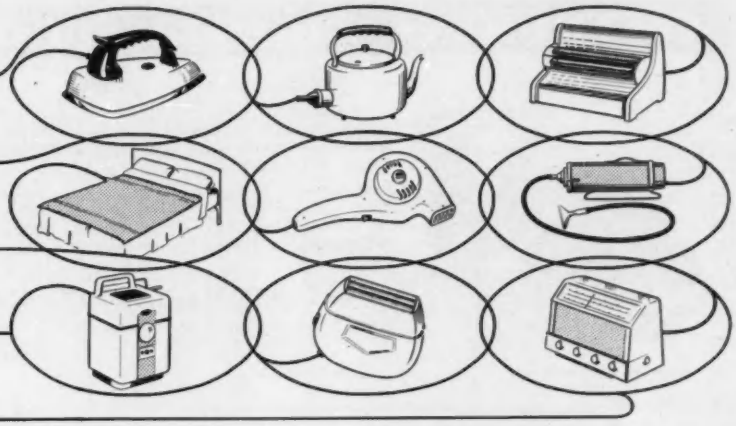

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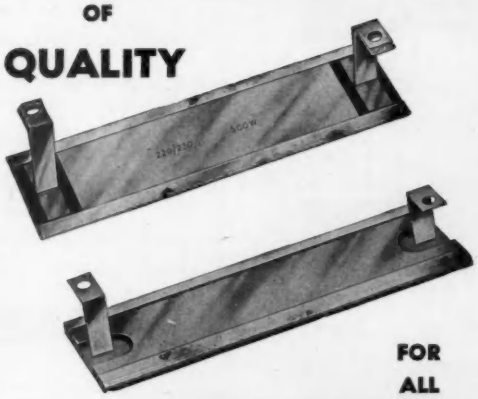

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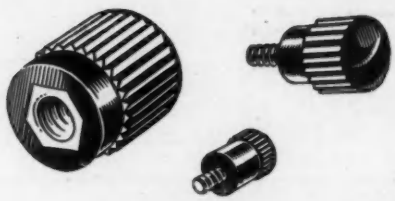

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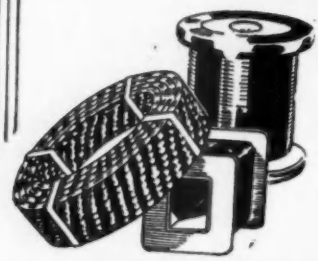

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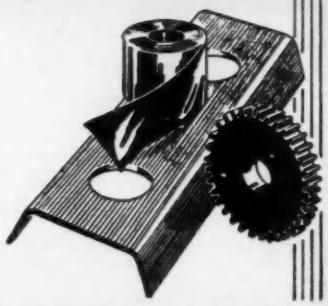

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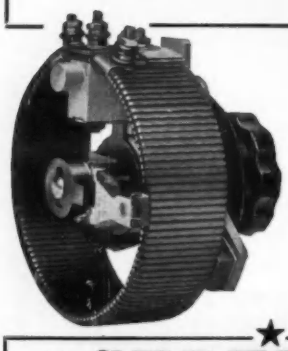

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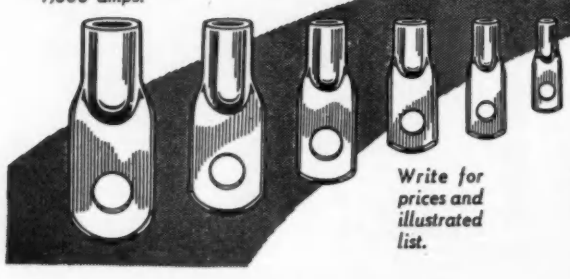

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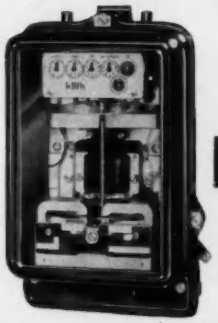

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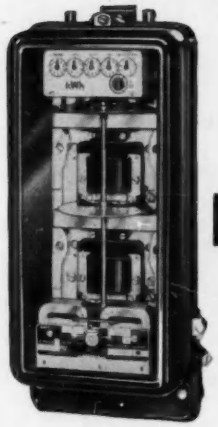

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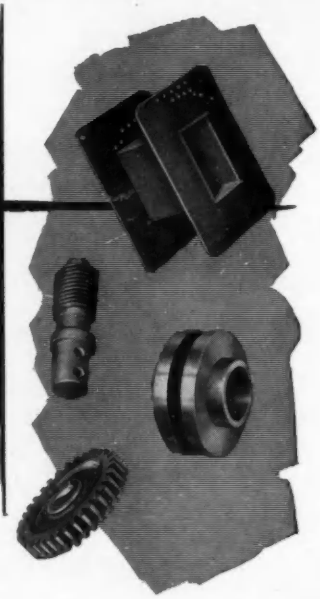

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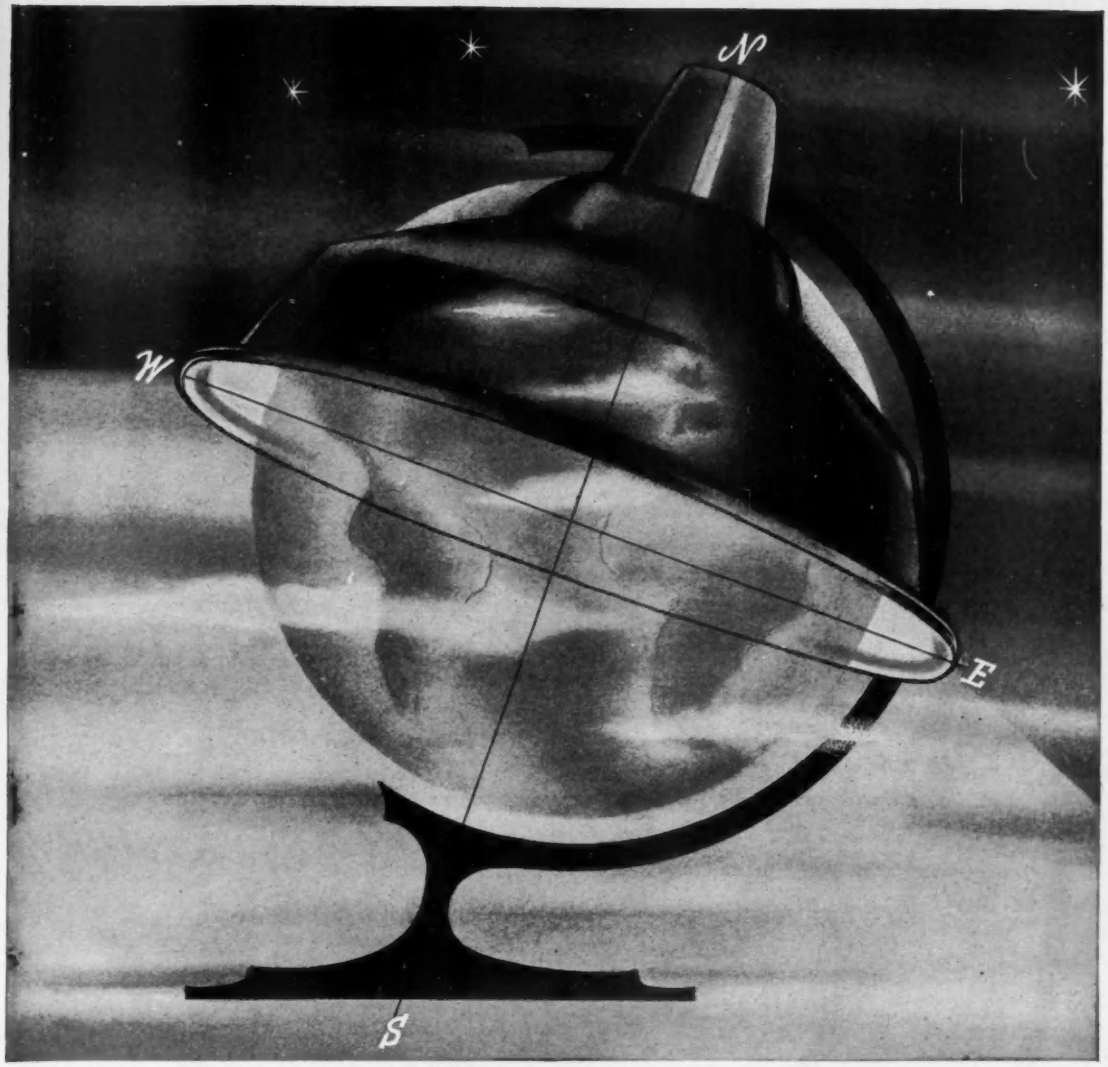

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8 AUGUST
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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This 400 MW semi-outdoor generating station near Derby is in an advanced stage of construction. The first turbo-alternator/boiler unit has been commissioned. The main plant items include four International Combustion boilers, the operating steam conditions being 1,500 p.s.i. and 1,050 deg F at the turbine stop valve

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VOLUME 163 NUMBER 6 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

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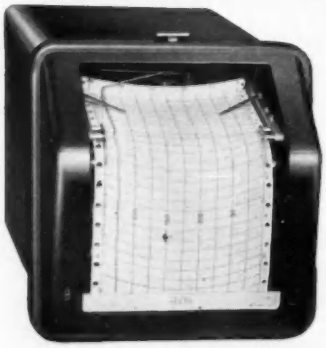

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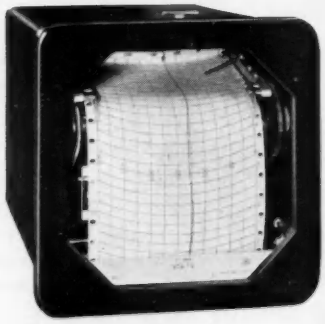

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ELECTRICAL REVIEW

8 August 1958 Vol. 163 No. 6 Established 1872

Overseas Conditions

COMPARED with industrially advanced countries, those parts of the world in earlier stages of development present problems that are generally far more diversified. They possess, however, the inestimable advantage of being able to draw upon the experience of countries which now enjoy a higher degree of prosperity, largely as a result of the use of engineering techniques, evolved over long periods of time, for harnessing natural resources for the production of energy.

In consequence, while electrical practice of the advanced nations now tends to converge to a common norm, the range of possible conditions elsewhere is usually much wider. At one end of the scale opportunities occur to alleviate hardships of primitive means of existence in such minor ways as the generation of electricity by direct solar and wind power or small waterwheels or by simple and easily maintained oil engines. At the other end requirements would be for large hydro and steam plants including, later, possibly nuclear-fuelled plants.

A good example of the mixed conditions which may be encountered is provided by the Kariba Gorge hydro-electric undertaking in Rhodesia, particulars of which were given in an I.E.E. paper by Messrs. F. C. Winfield, T. W. Wilcox and G. Lyon (reported in our issue of 2nd May). Although a nucleus load for absorbing the 600 MW to be available at the first stage of the Kariba power stations exists in a small number of large towns (now served by steam stations comparable in output with those in many European countries before the war), the plans for Rhodesia cover a very much larger terrain with a view to supplying a relatively small and previously mainly uncharted agricultural area. The vast distances envisaged, rather than load density, determined the choice of 330 kV for transmission (a voltage which is equalled or surpassed in few countries to-day). Inadequate transport and extreme manifestations of nature were representative of the numerous problems that usually have to be solved in such schemes.

At the last British Electrical Power Convention, Messrs. J. G. Beverley, E. G. Teasdale and A. Wilmot, in their paper on British hydro-electric equipment abroad (*Electrical Review*, 20th June), fully substantiated, from the manufacturers' angle, the claim by Mr. C. W. G. Walker (secretary, Association of Consulting Engineers) in a subsequent letter to *The Times* that consulting engineers formed the spearhead of engineering construction in regard to the export of British products. At the same Convention Mr. Harold J. Beard produced abundant evidence of the great value of the diversity of consultants' experience (both technically and financially) obtained in a variety of countries when applied in collaboration with those having local responsibility.

EAST-WEST TRADE RESTRICTIONS

Although details will not be available for a week or so, it is certain that the electrical industry will benefit from the forthcoming relaxation of the restrictions on trade with Russia and China announced last week by Lord Gosforth (Under-Secretary of State for Foreign Affairs). Lord Gosforth used the term " substantial " in connection with the relaxation and said that the Government's objective of confining the list to items of real strategic significance had been achieved in great measure.

It is noteworthy that while the United States has agreed that Great Britain and other countries represented on the Co-ordinating Committee (" Cocom ") can relax their restrictions, that country has no intention at the moment of removing its total embargo upon the export of American goods to China.

OUTDOOR POWER PLANT

The Willington " A " generating station which is described in detail in this issue is unusual in a number of respects. The boiler plant is of semi-outdoor design and the layout is unconventional in that it is an " H " formation with the four boilers grouped together in facing pairs to form the cross-leg of the H and with two turbines in line on each side. When we visited the station we got the impression that the designers had perhaps gone a little too far in squeezing the maximum amount of plant into the smallest possible space. Everything seemed very cramped, although admittedly the plant was still in the throes of construction and there never seems to be much room in a power station when the contractors are still in occupation.

During our visit the weather was very cold and there was a heavy snowfall. In these conditions we could not help wondering whether the British climate is really suitable for semi-outdoor power plant. With snow and ice on the stairways around the boiler and icicles hanging from the handrails the conditions were far from ideal and would certainly be an embarrassment to the operators when they were dealing with some maloperation of the boiler plant.

INFORMATION PRESENTATION

Most instruments produced to-day present the information in a different form from the input signal. For example, voltmeters actually measure the mean value of the current through a high resistance, yet the r.m.s. value of the voltage is indicated by the instrument. An article in this issue discusses the meaning of adequate instrumentation and reviews some modern equipment which presents the quantity measured in a lucid form. The instrument should indicate the information so that the person receiving it does not have to perform calculations to arrive at the quantity he requires.

Better instrumentation does not necessarily mean more instruments. Perhaps the production of power from nuclear energy is the most important application of adequate instrumentation. The behaviour of the reactor can be anticipated only by continually watching a number of trends. Control of many other operations depends on the quick assessment of the associated instrument readings. Any reduction in the number of instruments, resulting in a combined instrument providing a directive to the operator, will tend to avert incorrect action.

INDIVISIBLE LOADS

We published in our last week's issue a memorandum sent on behalf of the British Electrical and Allied Manufacturers' Association to the Ministry of Transport protesting against the proposal to exclude heavy indivisible loads from the new motorways. It is gratifying to see that this and similar protests by other industrial organisations concerned have had effect. The Minister announced in the House of Commons last week that before making final regulations he intended to allow indivisible loads to use the new motorways and then to stop them for perhaps a week, permitting only private cars, so that the effect could be gauged.

We suggest that in a matter of this kind the criterion should not be how much private traffic is inconvenienced. Industrial considerations should come first, particularly when the loads are being taken to the ports for shipment overseas. It is easier for private traffic to use the older, less direct, routes than for heavy industrial loads to do so. It must be admitted that the problem is not a simple one. The Ministry's Report on Roads in England and Wales for 1956-57 shows that movements of " abnormal indivisible loads " are now of the order of 20,000 a year. Of these about 90 are over 150 tons or more than 20ft wide.

CLEAN AIR

In our issue of 27th June, Dr. H. E. Crossley and Mr. G. England referred to the practice of the Central Electricity Generating Board of measuring the extent (if any) of change in the amount of atmospheric pollution at ground level round all new power stations. These tests are supplementary to the now well-established means of avoiding offence as set out by the authors, which are now embodied in their design.

A comprehensive range of precision instruments for this and other purposes, covered by the Clean Air Act, is already available, according to information received from the Scientific Instrument Manufacturers' Association (S.I.M.A.). For many cases advantage has been taken of testing facilities provided by the Central Electricity Research Laboratory. One example is of a meter designed to measure the amount of sulphur-dioxide in the atmosphere and to determine the direction of its travel and even the particular chimney from which it is emitted.

"ELECTRICAL WHO'S WHO"

The fifth edition of the " Electrical Who's Who " is now available. Its nearly 8,000 entries cover all branches of the electrical industry and profession. Copies are obtainable at 27s 6d (postage 1s 6d) from Electrical Review Publications, Ltd., Dorset House, Stamford Street, London, S.E.1, or from booksellers

Value of Adequate Instrumentation

By J. H. REYNER
B.Sc., M.I.E.E.

Measurement provides an extension of our powers of perception, but few instruments actually measure the quantity indicated on the scale. To assess the validity of the indication the users should always be aware that the instrument is measuring some physical or electrical phenomenon proportional to the quantity to be measured. Adequate instrumentation means that whatever quantity is indicated it must be clear and unambiguous. The author makes a broad survey of the facilities provided by modern instruments in various spheres.

SURVEY OF FACILITIES PROVIDED BY MODERN EQUIPMENT

THE world at large has ceased to wonder at the technical achievements of the past few decades. Indeed, if it were announced in the Press that a new material had been discovered which enabled the wearer to walk six inches off the ground, the statement would probably be accepted without any great surprise. This facile acceptance of modern marvels is perhaps excusable in the case of the general public, but one cannot help wondering whether the engineer and the scientist of to-day are not equally prone to take for granted things which their training should cause them, at any rate, to question.

The vast bulk of our scientific knowledge to-day is indirect. The evidence of our senses, remarkably adequate for the preservation of physical existence, is nevertheless totally inadequate for the detection and examination of even the simplest processes involved in modern civilisation. This is particularly so in the electrical field where we have become so accustomed to talking about electrons and atoms that we entirely forget the fact that all our knowledge of the subject, and the associated problems of the structure of matter, is entirely the result of indirect observation.

Measurement, in fact, provides an extension of our powers of perception. In the field of research the information is required as a means of investigating behaviour and suggesting further methods of approach. In the industrial field the purpose of the information is fundamentally precautionary, its purpose being to show what is happening and to provide prompt and clear warning of any deviation from the required conditions.

Removal of Doubt

With this in mind it becomes possible to consider more closely what is meant by adequate instrumentation. The first consideration is that of the measuring instrument itself and it can be said that the primary function of an instrument is to remove doubt. Consequently, the instrument itself must be beyond reasonable doubt, so that the first definition of adequate instrumentation must be that the instrument in question shall provide clear and unequivocal information about the quantity being measured.

This would appear to be a self-evident fact and indeed it is a well-known axiom that an instrument must not introduce any appreciable modification of the condition being examined. But this is not sufficient. It is necessary to be aware of what is actually being measured and make sure that this is what is required to be known. For example, many of the voltmeters and ammeters in common use to-day are calibrated in terms of the r.m.s. value, but in fact, if they are rectifier instruments, what they are actually measuring is the mean current and the indication is calibrated in terms of r.m.s. value on the assumption of a sinusoidal waveform.

This is particularly the case with valve voltmeters, some of which measure peak voltage while others measure the average value, but both types are usually calibrated in terms of r.m.s. value. This does not mean that they are not useful instruments. Indeed, in some circumstances it is the peak condition which is important, as, for example, the peak current in a cold-cathode tube, which is the factor having the greatest influence on its operating life. The point is that practically no instrument actually measures the quantity indicated on the scale, but some physical or electrical phenomenon proportional to the quantity to be measured, and the user should always be aware of this so that he can assess the validity of the indication in the particular circumstances.

What is Adequate Information ?

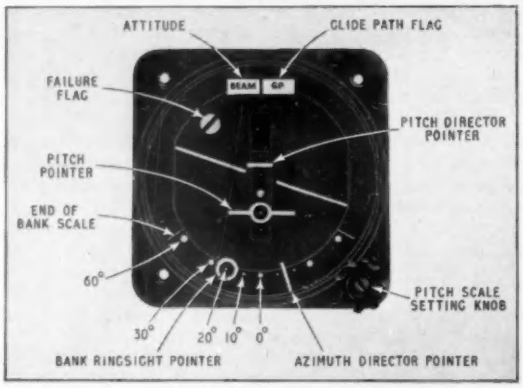
Apart from these considerations, however, there is a second and more important factor in our definition of adequate instrumentation. It is that the information provided must be of such a form as to permit the appropriate action to be taken with the least confusion or delay. In the majority of cases, indeed, the information requires translating before being presented. Even a simple meter

Typical modern valve voltmeter measuring from 1 mV to 1,000 V at frequencies from 10 c/s to 10 Mc/s (Furzehill Laboratories, Ltd.)

does this, for what it actually registers is the torque resulting from the interaction between an electric current and a magnetic field, but this is translated to indicate voltage or current or some other physical quantity.

Actually the human body carries out this translation to an extraordinary degree. If you put your finger in a flame the body does not say " This is a temperature of so many degrees." It says " Take your finger away." The information is associated with a highly-organised servo-mechanism which produces the desired removal of the finger from the source of danger very speedily, but this servo-mechanism is actuated by the information presented to the brain that the temperature to which the finger is being subjected is dangerously high. It is, in fact, related to a previously laid-down standard.

Adequate instrumentation requires the same translation of the information. This is especially the case in connection with equipment which operates at a high speed or in which very rapid decisions are necessary. A good example of this is in the instrumentation required on an aircraft. Early flight instruments presented only partially translated information regarding the height, air speed and so on. Later, instruments began to be added which gave



Smith " Director Horizon." An excellent example of presentation of information in the most positive manner. (Smiths Aircraft Instruments, Ltd.)

information about the attitude of the aircraft which was particularly necessary under blind-flying conditions. With the increasing speed and complexity of aircraft, however, this information was insufficient. It was necessary for the pilot to think what to do if the instruments indicated an incorrect attitude and under the stress of blind-flying conditions, which may have endured for an appreciable time, the translation of this information into action not only occupied precious seconds but was often incorrect. It therefore became necessary to devise instruments which told the pilot what to do in order to restore conditions to normal and all the equipment on a modern aircraft is designed to provide this immediate indication of the action required.

An example of this is the " Machmeter " which is now a standard fitting on all high-speed aircraft. The maximum speed at which an aircraft can safely travel is determined in relation to the speed of sound, but this varies according to the height above sea level. Moreover, the ordinary air-speed indicator is also affected in its readings by height and temperature so that in order to determine whether the air speed was safe it would be necessary first for the pilot to correct the air speed and then to relate this to the speed of sound at the particular altitude—an obvious impossibility, having regard to all the other simultaneous demands on the pilot's ability. The solution, of course, is to present the information in a single instrument which gives the relative speed of the aircraft in relation to the speed of sound in the particular conditions under which the aircraft is flying.

It is worth citing a further, and more elaborate, instance of aircraft instrumentation because the particular needs of that industry have warranted the expenditure in the development of some excellent examples of translation of information. The " Director Horizon " illustrated is used in the Smith Flight System which combines a number of functions in the one instrument with a completely positive action presentation. It comprises the customary horizon bar (which is horizontal and central when the aircraft is flying straight and level) to which is linked the bank ringsight (at the bottom) which indicates the angle of bank. A modern aircraft is turned primarily by its ailerons so that to change course the pilot applies a suitable degree of bank for the requisite time until the required course is attained.

In many circumstances, particularly during approach, the required heading is obtained from a radio beam. In the S.F.S. this information is compared with the actual heading and from this is derived the angle of bank necessary to produce a turn which will bring the aircraft on to its true course. This is indicated on an azimuth director pointer and all the pilot has to do is to bring his bank ringsight over this pointer. In the illustration the indication to the pilot is to cease his turn to port and commence a slow turn to starboard by applying approximately 15 deg of right bank. As he comes on to course the director pointer will begin to move towards the centre and the pilot will follow it with his ringsight.

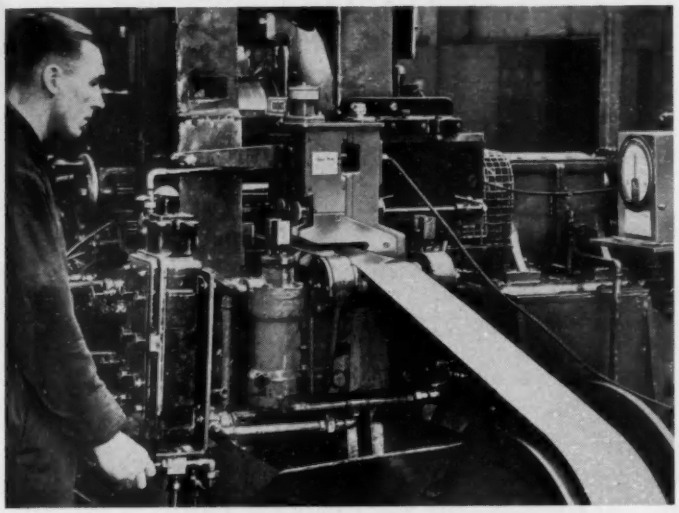
Similarly there is, in the centre, a pitch pointer indicating the actual nose attitude, with a director pointer controlled by the radio signal showing the attitude required for correct angle of glide. The indication shows too steep a descent, requiring the nose to be brought up until the pitch ringsight coincides with the pitch pointer.

In practice, since ideal conditions rarely obtain, there will inevitably be some unsteadiness. Turbulent air will cause deviations of the actual attitude while an unsteady radio signal may cause the director pointers to fluctuate. In either case the pilot can see immediately what is happening. In fact, the presentation not only tells the pilot quite definitely what to do, but why he is being told to do it, so that he will obey his instrument with confidence. There are other refinements which need not be discussed here, and, of course, the commands may be, and frequently are, transmitted to an auto-pilot. This will automatically perform the required operations and bring the ringsights and director pointers into coincidence so that if the auto-pilot has to be taken out of service at any time the pilot merely has to maintain the already existing conditions manually.

It will be clear, therefore, that adequate instrumentation does not necessarily mean more instruments. Indeed, the converse is more likely to be true, the tendency being to combine information from several sources to provide positive action information on one instrument only.

Increasing Requirements

The field of aeronautics is not the only one in which the requirements are becoming steadily more stringent. In all spheres of action the continuing development brings in its train the need for more precise and possibly more accurate information, so that the needs of adequate instrumentation are continually changing. It is, for example, no longer sufficient in a generating station to stoke the boilers until the necessary steam pressure is obtained.



Thickness gauge built into a strip mill for continuous monitoring of foil thickness. (Taylor, Taylor Hobson, Ltd.)

Apart from the fact that any haphazard burning of the fuel would quite possibly fail to maintain a satisfactory head of steam, the economics of modern generation require that the fuel shall be burned at maximum efficiency. Therefore, to-day, it is necessary to maintain a more or less continuous analysis of the constitution of the flue gas, particularly in respect of the CO_2 content and here again the information should be presented in such a form as to indicate what action is to be taken. This also may be referred to an automatic control which eliminates the human element.

In another sphere, it is now appreciated that fruit shipped in refrigerated holds has to breathe and the extent to which it can do this, and so maintain its condition, is dependent on the CO_2 content of the atmosphere, which is itself liable to change by the very breathing of the fruit. Consequently it is necessary under modern conditions to monitor the CO_2 content of the hold.

In the chemical industry the requirements for instrumentation under modern conditions are too numerous to mention individually. It need only be pointed out that the great majority of chemical processes take place in the form of solution and a control of this can be accurately monitored by a measurement of the pH value.

These are but a few illustrations of the need to-day for much more accurate information regarding the processes involved. A device for the continuous monitoring of the foil thickness in a strip mill costs a negligible amount by comparison with the savings which result. Indeed, with modern mass production the cost of quite minor deviations may become prohibitively high.

C.R.T. Presentation

Instrumentation to-day does not only include the customary meter presentation. The use of the cathode-ray tube is of increasing importance because of its ability to present information in a readily assimilable form. An example of this is the quality checking of magnetic materials which, for many of the special techniques involved to-day, require to be within quite close tolerances over certain parts of the B-H curve. This may readily be presented on a cathode-ray tube either as an absolute measurement or as a comparison with a standard. The use of this technique is not limited to electrical requirements. For example, tempered steel has a distinctive B-H curve so that the quality of products such as valve springs may be checked very readily on a magnetic sorting bridge.

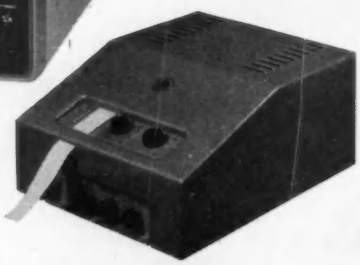
Another form of cathode-ray presentation is in flaw detection where a supersonic pulse is applied to the surface of the material and the echo presented on a cathode-ray tube. If the material is homogeneous and free from flaws a single sharp echo is obtained from the rear surface of the material, but any flaw or lack of uniformity causes subsidiary echoes to be produced at a time interval shorter than that required to traverse the whole material and this time interval can be presented on the tube in terms of distance.

Another industrial application, particularly in the chemical and medical fields, is in spectro-photometry, where the constitution of any particular sample can be determined with great accuracy by its spectrogram which can be presented on a cathode-ray tube in a form which translates the information into a clear indication of acceptability or action required.

In the initial research and development which must necessarily precede production processes a further aspect of adequacy becomes evident. Here it is desirable that the equipment being used shall be able to cater for unusual conditions which may arise during the progress of the investigation. The implications of this requirement are so wide that it is only possible to cite one typical example. In the field of oscillography, it is now almost invariably the custom to provide deflection amplifiers to amplify the signal before applying it to the deflector plates of the tube. It is a great advantage if the amplifiers used for this purpose are symmetrical so that they can be used with a balanced input. This makes it possible to measure the potential difference between two points in a circuit, both of which are fluctuating with respect to earth. A properly-designed balanced amplifier will discriminate many hundreds of time against push-push signals, i.e. variations in potential of both points together relative to ground, while giving full amplification on any variation between one point relative to the other. A second feature

Magnetic sorting bridge being used to check the hardness of steel bolts. (General Electric Co., Ltd.)

Typical modern oscilloscope providing differential input with calibration facilities for time and voltage. (Furzehill Laboratories, Ltd.)



A modern printing watch timer which records not only the time-keeping but also discloses any defects in the watch movement. (British Watch Timers, Ltd.)

in modern cathode-ray oscillography which is now practically essential is the provision of facilities for measurement both of the voltage developed and the time interval on the time base.

Watch Rate Recording

An application which introduces yet another aspect of instrumentation is in the field of horology. Here for a long time it appeared that there was no particular need for instrumentation because a precision timepiece is itself an instrument of the highest calibre. However, the ultimate function of a watch or clock is to record the time accurately and consistently over long periods. To check this it was necessary to hang up the watch for a 24-hour period and find how much it gained or lost during the process. With certain classes of timepiece this is still necessary, but for present-day requirements the process is, in general, far too slow. To-day, it is practicable to compare the instantaneous timekeeping of a watch mechanism by comparing the time interval of the watch tick with an electronic frequency standard derived from a quartz crystal or other suitable standard. Although this gives only the instantaneous rate it is possible to make a series of tests with the main spring fully wound and at varying degrees of run-down and, moreover, the movement can be tested in various positions to check the accuracy of the poising, which is a function of the dynamic balance of the balance wheel itself. With suitable apparatus, tests such as this can be carried out in a few minutes and the saving in time is obvious.

In this application, however, the presentation of the information becomes even more important. It is usually of less importance to know the exact amount of the error than to know quickly what action has to be taken in order to regulate the watch to keep perfect time. Even more important, if the comparison of the time intervals between the watch ticks and the frequency standard is suitably presented it can disclose any irregularities in the gear train by which the movement of the escape wheel is transmitted to the hands. Such irregularities invariably exist to a greater or less degree and although the skilled watchmaker can often diagnose defects by listening to the sound of the movement, his task is considerably eased if the information can be graphically presented. One of the latest types of watch-rate recorder delivers a printed record of the performance of the watch, indicating immediately not only its timekeeping but the condition of the movement as a whole.

These techniques are not limited to watch repairing but can also considerably facilitate the production of clocks or watches to a precision standard, particularly when these are being manufactured at the rate of some thousands per day, while the use of instrumentation such as this during horological research is of the utmost value.

Nucleonics

The need for instruments in the field of nucleonics is a subject in itself, and there is no space here in which to deal with the subject in any detail. It is clear from the outset that adequate measurement of the radiation from radioactive materials is of vital importance and the stringent precautions which are taken are well known. In atomic piles great use is made of the invaluable corollary of instrumentation, namely the ability to measure the trend of any particular quantity and so anticipate behaviour.

Reference may be made in passing to one aspect of nucleonics which is likely to be of increasing importance. This is the use of radioactive materials to provide, in association with other forms of instrumentation, information which would normally not be obtainable. One example of this is the use made in research on lubricating oils where a small proportion of radioactive material is introduced into the moving parts of a mechanism and the lubricating oil is subsequently examined for radioactivity. The minute traces of material which are worn off by the friction between the moving parts are carried away in the oil and can be detected by this extremely sensitive means almost as soon as the wear has taken place, whereas by older methods the only procedure is a test to partial or complete destruction.

Conclusion

Enough has been said to indicate what is meant by adequate instrumentation. In the field of research it implies the ability to present the maximum possible information in a manner which indicates the direction of future development. Needless to say, this is an ideal which is only partially achieved. In the field of applied engineering, adequate instrumentation means the presentation of information in a manner which gives a clear and unambiguous directive to the person receiving the information and, as we have seen, this does not necessarily mean more instruments but may mean less.

At the same time the steady development of industry requires a comparable increase in instrumentation if the best results are to be obtained, and methods which were satisfactory a few years ago may well require revision and the provision of more up-to-date equipment. In some directions, notably the aircraft industry, very great strides have been made because the requirements of the industry and the finance available have made it possible to devote the necessary research to the problems. There would appear, however, to be many fields of industrial activity in which the instrumentation to-day is still far from adequate. This may indeed arise from failure of the industries in question to appreciate what can be done and in view of the likely competition when the European Free Trade Area comes into being this may well be a matter deserving of more consideration.

The scientific instrument industry of Great Britain is not only highly skilled but progressive in its thinking and the future prosperity of the country will depend in no small measure upon the effectiveness of the co-operation between industry and the instrumentation designer.

POWER STATIONS OF 1957

WILLINGTON "A"

This article describes in detail the construction of the 400 MW Willington "A" generating station situated between Derby and Burton-on-Trent. The station accommodates four 100 MW English Electric turbo-alternators and four International Combustion 830,000 lb/hr boilers operating on the unit principle with steam conditions at the turbine stop valve of 1,500 p.s.i. and 1,050 deg F. The station is of semi-outdoor design and is in an advanced stage of construction; the first turbo-alternator/boiler unit has been operating for some time.

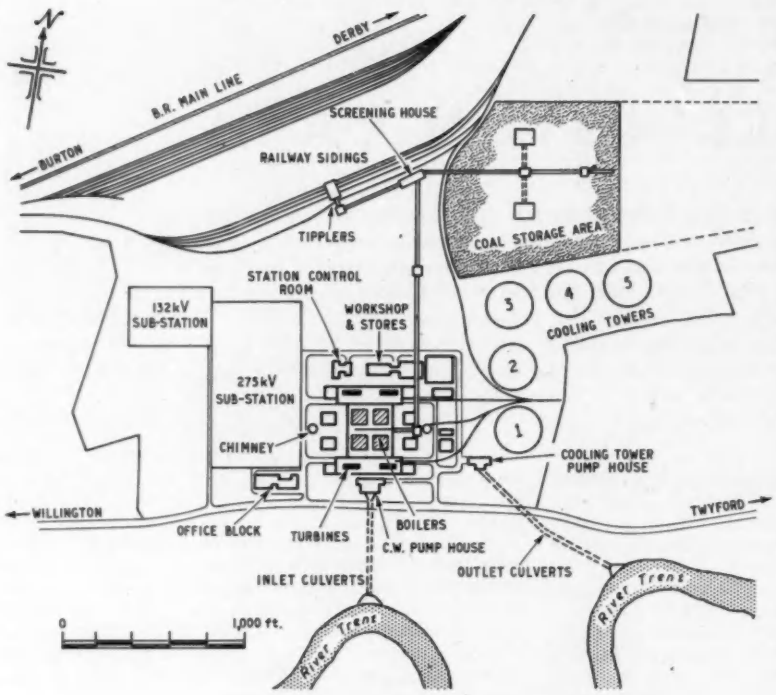
CONSTRUCTION work on the 400 MW semi-outdoor generating station at Willington, between Derby and Burton-on-Trent, is now at an advanced stage and the first of the four 100 MW turbo-alternator/boiler units has been in commission for some months. It is planned to commission two more units before the end of the year, and the remaining one early in 1959.

As is usual these days, Willington "A" is of unit design, there being one boiler for each of the 100 MW turbo-alternator sets. It is built on what is known as "wash land" on the north bank of the River Trent about ¾ mile east of Willington village. It is the ultimate intention to build a "B" station of similar generating capacity on the same site which will accommodate two 200 MW reheat units. The 194 acre site is laid out as shown in the accompanying diagram with the British Railways main line running along the north side. A double-track connection is provided to the coal sidings. Good road access for coal supplies is also available. The coal storage area has a capacity of about 200,000 tons but this will be extended when the "B" station is built.

The station plant is laid out in "H" formation with four boilers grouped in facing pairs in the centre to form the cross-leg of the "H," and with two turbines in line on each side. The turbines operate with steam conditions of 1,500 p.s.i. and 1,050 deg F and austenitic steel piping has been used between boiler and turbine. Behind each boiler, extending out from the centre line, is a mechanical dust collector and electrostatic flue gas cleaning plant. Each pair of boilers is served by a 425ft high reinforced concrete chimney. There is a plant control room for each pair of units and this is situated between each pair of boilers and turbines at turbine floor level, with convenient access to all levels.

Fuel supplies are delivered to the station mainly by rail. Coal is transferred to the bunkers either from stock or wagon tippler by means of conveyor belts. The four 1,500 tons capacity bunkers are arranged in similar fashion to the boilers and each supplies four International Combustion type LM16 "Lopulco" pulverising mills associated with each boiler. The coal sidings have a total standage capacity of 850 20-ton wagons. The wagons are brought to the tippler approaches by diesel shunting locomotives, then conveyed to and withdrawn from the tipplers by means of electrically-operated "beetle" in-haul and out-haul equipment. The wagons are

Willington "A" power station. (Photo—C.E.G.B.)



Site plan

weighed and emptied by 350 tons/hr Strachan & Henshaw "Rotaside" tipplers.

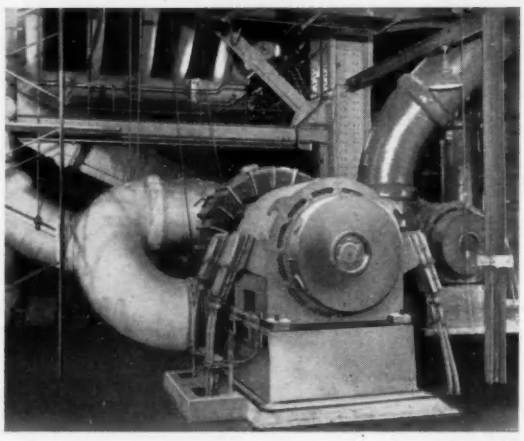
In addition to centralised control facilities for the main plant in the station, similar features have also been embodied in the coal handling plant, where from a single mimic diagram type of panel the complete sequence-operated system can be controlled. The wagon tipplers are, of course, separately controlled and photo-cell equipment prevents operation of the plant in the event of inadvertent approach of wagons or personnel. The tippler house is also provided with dust extraction equipment. The coal can also be put in the storage area by means of a 700 tons/hr reversible conveyor and travelling boomstacker. Two Vickers bulldozers are employed to move coal from stock to the reclaiming hoppers and to stack coal discharged from the boomstackers. Magnetic separators are provided to remove any tramp iron. All coal is screened and crushed to 2in maximum size, before passing to the boiler bunkers.

Each of the four p.f. mills has a capacity of 16 tons/hr when dealing with coal having a moisture content of 14 per cent and is driven through reduction gearing by a 185 h.p., 1,480 r.p.m., 3·3 kV Laurence Scott induction motor. Three mills are capable of maintaining full load on the boiler with coal of this moisture content and 15 per cent ash. A table and plough type feeder is associated with each mill and this is driven by a 0·28/2 b.h.p., 314/2,200 r.p.m. variable-speed motor. Each mill exhauster is of the two-stage paddle blade type and is driven by an 82/305 h.p., 960/1,470 r.p.m., 3·3 kV variable-speed Laurence Scott motor which is automatically controlled or regulated from the unit control room.

The exhauster fans draw the pulverised fuel/air mixture from the mills via the separator and deliver it to the sixteen burners which are situated in banks of four at each corner of the boiler. The burners are arranged to provide tangential firing and so produce a high degree of turbulence inside the combustion chamber. They can also be tilted 30 deg above and below the horizontal for automatic control of the final steam temperature. For lighting up, pressure raising, boost firing and carrying up to 15 per cent load, an automatic oil-fired system has been provided. This consists of three burners at each corner of the boiler arranged for automatic spark ignition with mechanical atomisers and a separate motor-driven f.d. fan for each burner.

After combustion has taken place, the resultant ash is collected in the dry bottom ash chamber beneath the boiler which is capable of storing 36 hr ash with the boiler on full load. It is subsequently removed from the hopper and discharged into a sluiceway, by means of a Babcock & Wilcox "Hydro-jet" high-pressure water jet sluicing system, and thence to an ash bunker at the east end of the station. From here it is grabbed by means of two 35/40 tons/hr grabbing cranes and discharged into draining hoppers which form part of the ash bunker structure. After drainage it is again grabbed and loaded into road transport vehicles. Fine flue dust is removed from the grit arrestors and electrostatic precipitators by "Hydrovactors" and feeder ejectors and discharged into the ash sluiceway. It is conveyed to a dust sump, by-passing the ash bunker, and then pumped some 3½ miles to disused gravel pits.

Two high-pressure sluicing pumps (one normally acts as standby) of 2,500 gal/min capacity delivering at a head



Primary air fans

of 375ft are provided to supply water to the ash hoppers, sluice nozzles, feeder ejectors and "Hydrovactors." These are each driven by a 390 h.p., 1,482 r.p.m., 3·3 kV induction motor. The dust is pumped to the disposal area by two pumps in series, each rated at 2,900 gal/min at a head of 344ft and driven by a 290 h.p., 986 r.p.m., 3·3 kV induction motor. This arrangement is provided in duplicate including pipelines.

Steam Raising Plant

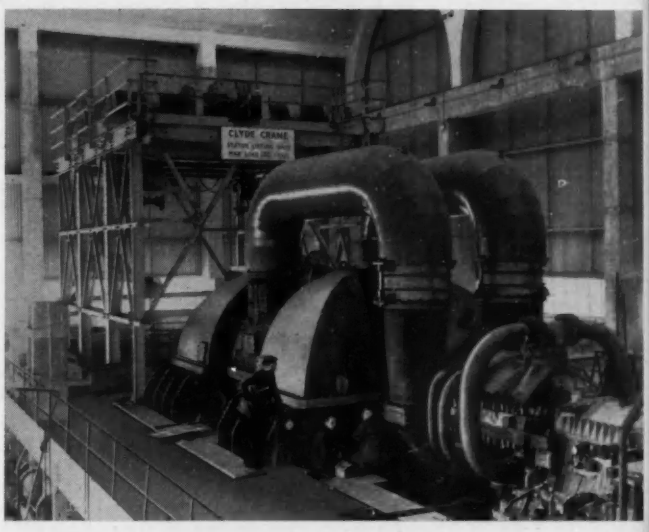
The four boilers are being supplied by International Combustion, Ltd. Each is a single-drum unit with a continuous maximum evaporative capacity of 830,000 lb/hr with the feed water at a temperature of 410 deg F. The steam conditions at the superheater outlet are 1,600 p.s.i. and 1,060 deg F. Each unit consists of a radiant boiler, primary and secondary superheaters, economisers, rotary air heaters, f.d. and i.d. fans, fuel-pulverising plant and automatic oil-burning equipment, together with mechanical and electrostatic dust extraction plant. The drum is of solid forged construction and there is a two-stage self-draining superheater and two-stage pendant type superheater. Spray type attemperators are interposed between primary and secondary superheaters which, with tilting p.f. burners, control the final steam temperature to within ±15 deg F.

The combustion chamber is of the fully cooled type with a volume of 73,300 cu ft. The exposed radiant surface excluding boiler tubes is 627 sq ft based on the semi-circumference of the tubes and superficial area of fins. The heating surface of the remaining boiler tubes is 627 sq ft. The tube diameter in each case is 3in o.d. The Superheater Co., Ltd., have installed the self-draining primary stage with a total effective heating surface of 35,940 sq ft and the pendant section with a heating surface of 7,430 sq ft. The steel used for these tubes is chrome-molybdenum alloy. The economisers are being supplied by both Senior Economisers, Ltd., and Green's Economisers, Ltd. These are of the steel tube type with "H" gilled sleeves shrunk on and are of all-welded construction.

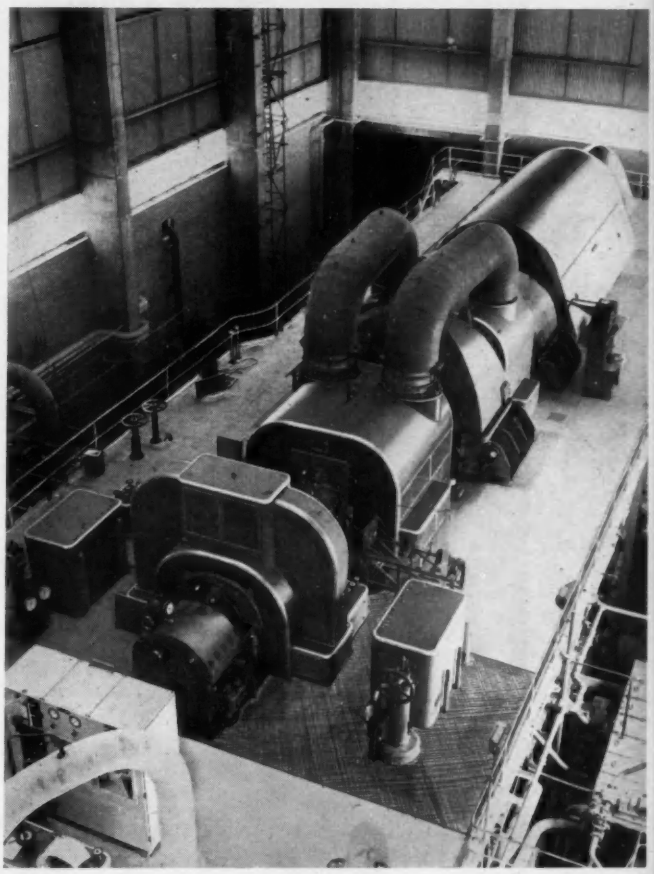
Automatic boiler control is carried out by means of an Electroflo pneumatic/hydraulic system. Variations in main steam pressure are sensed and transmitted to the f.d. and exhauster fans and mill variable-speed feeders. Variations in forced draught alter combustion chamber pressure and this, in turn, controls the i.d. fans to the required combustion chamber draught conditions. Falling steam pressures thus call for higher combustion rates and provide more f.d. for combustion, an increased supply of fuel and carrying air, and an increased amount of i.d. Provision is made within the boiler control system for remote manual operation of all dampers.

For each boiler there are two forced draught and two induced draught fans of Davidson manufacture. Each f.d. fan is designed to handle 151,000 cu ft/min and is driven by a Laurence Scott variable-speed 3·3 kV a.c. commutator motor rated at 180/455 h.p., 575/787 r.p.m. The i.d. fans are designed to handle 196,000 cu ft/min and these are also driven by Laurence Scott variable-speed 3·3 kV a.c. commutator motors rated at 57/860 h.p., 316/790 r.p.m. The air for combustion provided by the f.d. fans passes through two Howden-Ljungstrom rotary regenerative type air heaters, each with a heating surface of 110,500 sq ft. This air is delivered to the mills and wind boxes, the portion passing through the mills carrying the fuel to the p.f. burners via the exhauster fans.

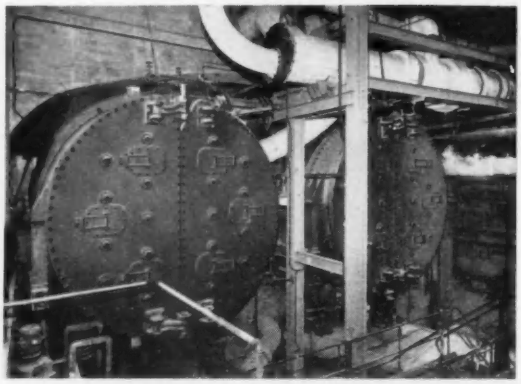
After combustion, the gases traverse the various sections of the superheater, the economiser, the air heater, Davidson "Sirocco" cellular pattern mechanical dust



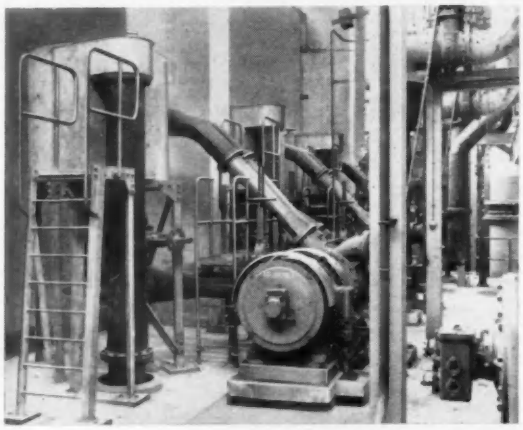
Turbine showing stator lifting gantry



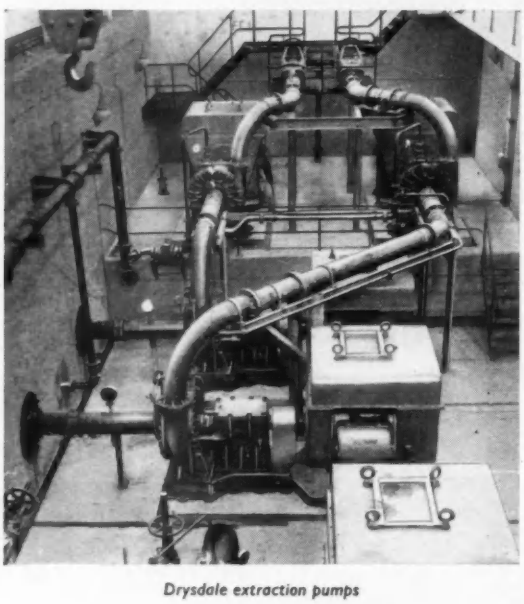
100 MW English Electric turbine



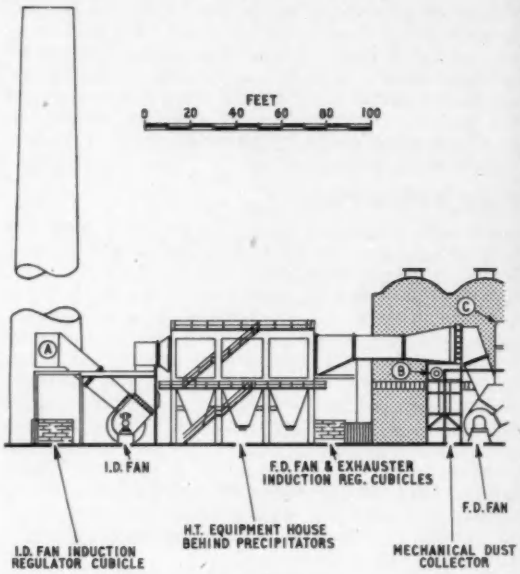
Condensers



Condenser air extraction pumps



Drysdale extraction pumps



Sectional elevation

extractors and Simon-Carves electrostatic precipitators on their way to the chimney.

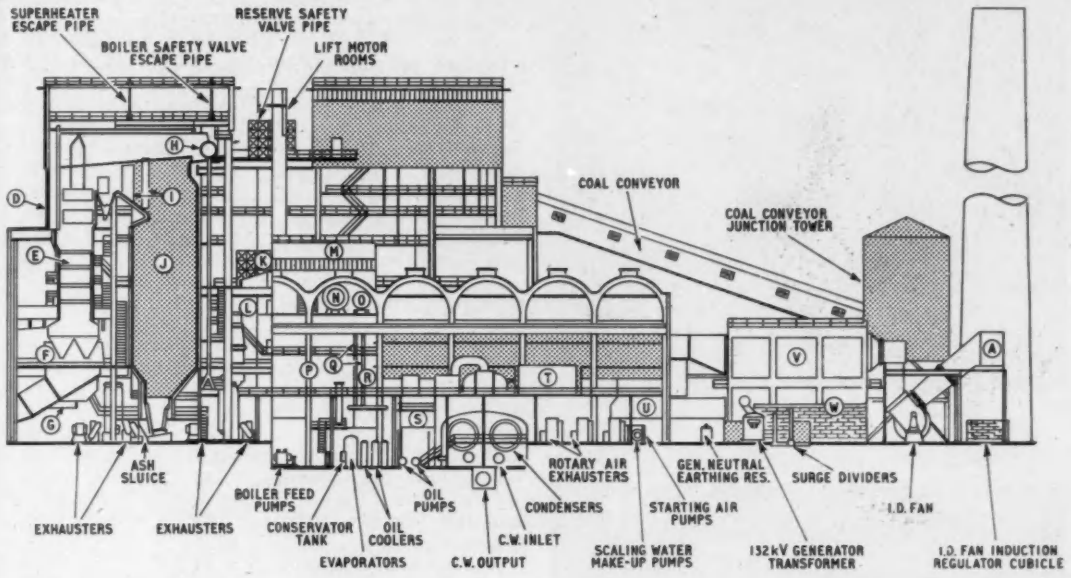
On-load cleaning of the boiler is catered for by the provision of automatic electrically-operated soot blowing equipment supplied by Ivor Power Speciality Co., Ltd. For the furnace there are 20 retractable gun blowers while the superheater is fitted with ten retractable lance type units, steam and air being supplied to all blowers at 600 p.s.i. and 300 p.s.i. respectively. Under normal conditions the furnace blowers operate for 1 min and consume 5,000 lb of steam and 80,000 cu ft of air, while the superheater units blow for 6 min and consume 15,000 lb of steam and 240,000 cu ft of air. There are also eight fixed blowers in the air heater.

Turbines

The four 100 MW English Electric three-cylinder impulse reaction 3,000 r.p.m. turbines are designed to operate with steam conditions at the turbine stop valve of 1,500 p.s.i. and 1,050 deg F, with six stages of bled steam feed heating, exhausting to twin condensers operating at 28·9in Hg vacuum. The specified steam and heat consumptions are 7·477 lb/kWh and 8,463 B.Th.U/kWh at m.c.r.

The cylinders are arranged in line. The h.p. cylinder has a Curtis type first stage and ten impulse stages. The i.p. cylinder has fifteen impulse stages while the double-flow l.p. cylinder has an impulse first stage and five reaction stages in each flow. The h.p. and i.p. blades are mounted on solid forged steel rotors while the l.p. rotor has shrunk and keyed-on discs carrying the moving blades.

The h.p. and i.p. casings are supported on their pedestals by extensions of the horizontal flanges on the lower halves of these casings and located by keys which allow lateral expansion of the casing. The casings are anchored securely at the supporting feet of one of the l.p. exhaust cylinders by transverse keys, and are free to expand axially in both directions from this point. All supporting feet and pedestals are free to slide. Each of the three turbine rotors is complete with its own flexible coupling and Mitchell thrust block to minimise the differential



(A) MAIN FLUE
(B) BOOSTER FAN
(C) RE-CIRCULATING AIR DUCT
(D) PRIMARY SUPERHEATER
(E) ECONOMISER
(F) AIR HEATER
(G) AIR SUCTION DUCT
(H) BOILER DRUM
(I) SECONDARY SUPERHEATER
(J) BOILER
(K) FILTERED WATER STORAGE TANK
(L) HOT AIR DUCT TO P.F. MILLS
(M) DEAERATOR TOWER
(N) DEAERATOR TANK
(O) ELECTRIC HEATERS & PUMPS FOR OFF LOAD DEAERATION
(P) PLANT CONTROL ROOM
(Q) MAIN STEAM PIPES
(R) OIL PURIFIER
(S) OIL TANK
(T) No.1 TURBO ALTERNATOR 100 MW
(U) CABLE TUNNEL
(V) ELECTROSTATIC PRECIPITATORS
(W) H.T. EQUIPMENT HOUSE

expansion. Flange heating is provided to assist cylinder expansion during starting up.

The centrifugal governor is accommodated in the steam end pedestal and driven from the turbine shaft by single helical gearing. The governor controls a primary oil relay which in turn controls secondary oil relays at the dual inlet throttle valves. Two emergency governors are fitted to the h.p. turbine shaft.

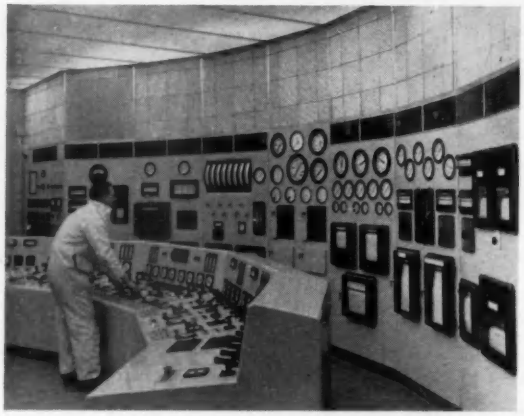
The main centrifugal type oil pump is driven from the turbine shaft and supplies oil at high pressure to the relay system. The oil then passes through a regulating valve to the lubrication system. A relief valve returns surplus oil to the oil tank. The three 50 per cent duty oil coolers are on the delivery side of the pump. A 100 per cent duty auxiliary a.c. motor-driven oil pump starts automatically when the relay oil pressure falls below a predetermined value. In addition, a d.c. motor-driven auxiliary oil pump for supplying lubricating oil only, is arranged to start up automatically in the event of a.c. supply failure. A separate oil pump supplies lubricating oil when the electrically-driven barring gear is being operated and at the same time a high-pressure pump supplies jacking oil, at 1,000 p.s.i., to the l.p. rotor and alternator bearings to reduce starting torque.

Steam exhausts from each flow of the l.p. turbine into twin two-pass condensers supplied by the English Electric Co., Ltd., which are together capable of condensing 531,180 lb/hr of steam at full load under design conditions. The total surface area is 76,700 sq ft for the two units. Air extraction from the condensers is carried out by three 50 per cent duty rotary Leblanc air pumps, each rated at 243 lb/hr when dealing with moist air. These are driven by 135 b.h.p., 415 V squirrel-cage induction motors. In addition, there is one quick-starting dry rotary air exhauster manufactured by Reavell & Co., Ltd.

Condensate is extracted from the condensers by means of two 100 per cent duty Drysdale extraction pumps, each capable of delivering 1,100 gal/min against a total head of 230ft and driven by a 130 h.p., 960 r.p.m., 415 V squirrel-cage induction motor. Condensate passes through a drain cooler and six stages of feed heating. The first three stages are l.p. heaters, the third being a high level de-aerator heater for which off-load de-aeration is provided. Before entering the h.p. heaters the condensate passes through a 1,610 gal/min booster feed pump of Mather & Platt manufacture which raises the pressure to 500 p.s.i.; the temperature of the pump inlet is 270 deg F. After the condensate leaves the h.p. heaters it is then fed to the boilers by the 1,763 gal/min capacity h.p. feed pump at 410 deg F and 1,910 p.s.i. Both booster and h.p. feed pumps are supplied by Mather & Platt, Ltd., and are driven by 2,500 h.p., 3·3 kV induction motors controlled by a single air-insulated circuit-breaker so that they can be started up or shut down simultaneously. These pumps are provided in duplicate for automatic standby and maintenance purposes.

Steam Evaporators

Each turbine has a pair of single-effect bled steam evaporators arranged to operate in double effect to produce boiler make-up water at the rate of 25,000 lb/hr. The evaporator steam supply is from the same point as No. 4 h.p. heater. The raw water for distillation purposes comes from Neckar automatic base exchange water treatment plant. The water supply for make-up purposes is from the local authority mains. In addition, a portable demineralisation plant with a capacity of 3,800 gal/hr is



Plant control room

Electrical control room

English Electric m.v. switchgear

available for initial boiler filling and commissioning. This plant was supplied by the Permutit Co., Ltd.

The 100 MW, 13·8 kV, 3,000 r.p.m. hydrogen-cooled generators and the 1,000 r.p.m. gear-driven air-cooled exciters are of English Electric manufacture. Ventilation is by means of axial flow type fans mounted on each end of the alternator rotor with oil gas seals and circulating hydrogen gas at a pressure of 0·5 p.s.i. although the system can operate at up to 15 p.s.i. The two hydrogen coolers are arranged longitudinally in the upper part of the stator frame. These coolers are supplied with distilled water flowing in a closed circuit. This water is circulated by one of two 100 per cent duty electrically-driven pumps through one of two 100 per cent duty tubular surface type heat exchangers. Cooling water for the heat exchangers is supplied from the main c.w. system.

Two field windings are provided in the main exciter, one winding applying a small constant negative excitation while all regulation is made on the other winding. Thus it is not necessary to reduce the shunt field current to almost zero to obtain very low exciter voltage. The shunt field regulator is therefore smaller than with a single field winding and the automatic voltage regulator duty is reduced. The English Electric voltage regulator has magnetic amplifier automatic control and a manual control rheostat.

All four alternators generate at 13·8 kV. Nos. 1 and 3 machines are solidly connected to both a 10 MVA, 13·8/3·3 kV unit transformer and a 120 MVA, 132/13·8 kV generator transformer. Nos. 2 and 4 machines are also solidly connected to a unit and generator transformers. The latter are rated at 106 MVA, 275/13·8 kV. The generator transformers are located at the ends of the legs of the "H" plan of the station. The 132 kV and 275 kV switching stations are situated at the west side of the site, both in the same compound but separated by a fence. Both 15 MVA station transformers are fed from the 132 kV busbars and supply the 11 kV, 350 MVA English Electric station switchboard. There are two 120 MVA, 275/132 kV interbus transformers. Station auxiliary plant is operated at 3·3 kV and 415 V via 11 kV step-down transformers. Loading and synchronising of the alternators is carried out from the unit plant control rooms. The 275 kV, 132 kV and 11 kV switching is operated from the main station electrical control room.

The cooling water for the station is derived from a combination of river water and cooling towers. Four main c.w. pumps of 4,100,000 gal/hr capacity supplied by Drysdale & Co., Ltd., each pump water direct to the condensers and other services; these are driven by 800 h.p., 300/296 r.p.m., 3·3 kV English Electric Co., Ltd., induction motors. The water is drawn from the River Trent via three inlet culverts and through coarse screens and rotary drum screens and is discharged via four outlet culverts, one for each turbo-alternator, to a downstream point where four siphon bends are provided. Two Davenport 4,500,000 gal/hr reinforced concrete cooling towers, together with three 3,000,000 gal/hr tower pumps, operate across the outlet culverts and intake sumps. Thus, water from the condensers is pumped to the cooling towers, which discharge into the inlet of the rotary drum screens from whence it passes through the main c.w. pumps.

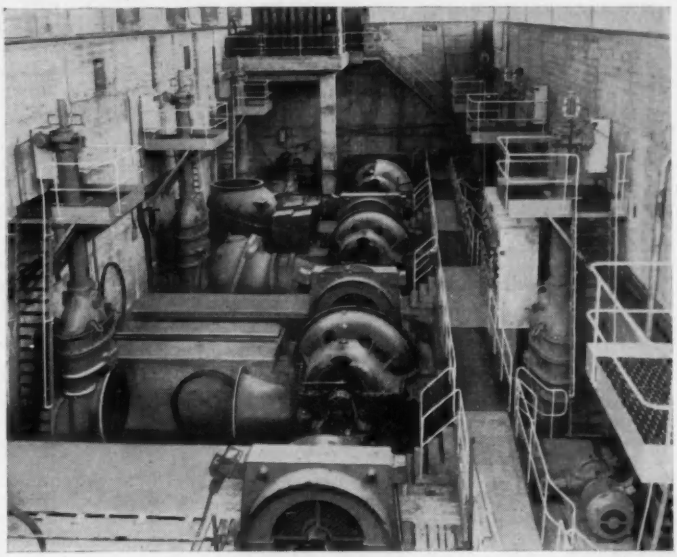
Plant Control Rooms

The layout of each plant control room is for two units, the combined boiler and turbine control desks being set in arc formation and facing each other on opposite sides of the room. The generator desks are side by side and are backed by the control panel for unit and station trans-

formers. All generator control, including synchronising, is carried out from these desks. Opposite the generator control desks and looking out over the turbine room are the control desks for the boiler oil fuel firing equipment and c.w. system. Alarm annunciators, mounted over the instrument panels, extend round three sides of the room. The automatic soot blower control panels are mounted at the extreme wings of the unit instrument panels and enable selective sequence operation to be carried out.

Wing annexes, one on each side of the plant control, accommodate the unit protective gear and automatic voltage regulators. Access to all control circuits is obtained in the cable room situated beneath the plant control and relay rooms.

All instruments necessary for the control of the unit are mounted on the panels in the control room and include provision for televised observation of boiler water level and combustion, turbovisory equipment, and superheater element metal temperatures.



Circulating water valves and pump

Remote operation of all important auxiliaries necessary for the operation of the unit is provided from the plant control room. This includes feed pump units, c.w. pumps and tower pumps which are designed to start up on open delivery valves. By these means centralised operation can be carried out. High combustion efficiency is attained under all load conditions by automatic control equipment. In addition, provision is made for adjustment of the boiler by a single hand control. The disposition of the c.w. system is indicated on a hand-operated mimic diagram.

The plant control room is generously illuminated without glare by means of concealed lighting above a transparent false roof giving an average light intensity of 40 ft-candles at 2ft 6in above floor level. The room is air conditioned, the conditioned air being Plenum heated to maintain a constant temperature.

This is situated at the north-west tip of the main plant buildings and is of conventional design and layout. The control panels are of the vertical type, the 132 kV and 275 kV controls being ranged along one side of the room, turning inwards at the ends. The 11 kV station services control boards are ranged on the opposite wall with the control engineer's desk between. Wing annexes house telecommunications equipment metering, and protective relays.

As in the plant control room, illumination is of the concealed type and heating and air conditioning is carried out by Plenum equipment. Light intensity is of the order of 30 ft-candles at 2ft 6in above floor level.

No generator synchronising is carried out from the station electrical control room. All other 132 kV and 275 kV switchgear in the high-tension compounds is, however, operated from the high-tension switchgear control panels.

Access from the station control room to the main plant building is provided by means of a pre-stressed concrete overhead glass-encased walkway.

The main consulting engineers for the station are Ewbank & Partners and the civil consultants are Sir William Halcrow & Partners, while the main contractors are:—Civil engineering works, Marples, Ridgway & Partners, Ltd.; cooling towers, Davenport Engineering, Ltd.; boilers, International Combustion, Ltd.; turbo-alternators, generator and station transformers and 11 kV and 3·3 kV switchgear, English Electric Co., Ltd.; 132 kV switchgear, General Electric Co., Ltd.; 275 kV switchgear, British Thomson-Houston Co., Ltd.; ash and dust handling plant, Babcock & Wilcox, Ltd.; coal handling plant, New Conveyor Co., Ltd.; water treatment plant, Neckar Water Softener Co., Ltd.; cables, Johnson & Phillips, Ltd.

Acknowledgment is due to Mr. L. F. Jeffrey, Divisional Controller, East Midlands Division, Central Electricity Generating Board, for permission to publish this article, and to Mr. G. T. Delamore, superintendent of the Willington "A" station, for the assistance he gave us in its preparation.

Atlantic Cable Jubilee

LAST Tuesday marked the centenary of the completion of the laying of the first transatlantic cable. It was not until a few days later that the first clear message was received from Newfoundland, and the cable was officially inaugurated by Queen Victoria and the President of the United States on 16th August.

The core of the first cable consisted of seven strands of No. 22 B.W.G. covered with three layers of pure gutta-percha and one of tarred hemp, and it was protected with iron wires.

The deep-sea portion weighed about one ton per mile and the shore ends were much heavier. The construction as well as the laying of the cable were in the hands of Mr. (afterwards Sir) Charles Bright, who was then 26. The cable cost some £225,000.

Several unsuccessful attempts had been made and much cable lost during the ten months before the cable ships left Queenstown on 17th July, 1858, on the "mad freak of stubborn ignorance" that was to end in triumph. During its short life the cable transmitted 732 messages, some of them quite long, and when it finally broke down on 26th October, 1858, it had unquestionably demonstrated the advantages of telegraphic communication between distant lands. An attempt to repair the cable in 1860 had to be abandoned because of the bad condition of the sheathing wires, and it was not until 1866 that communication was re-established with the cable laid by the *Great Eastern*.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Enfield Cables, Ltd., has announced the following changes in its organisation:—**Mr. J. E. Sunderland,** A.C.A., has been appointed managing director. **Mr. R. Bate,** M.I.E.E., has resigned his position as sales director to take up a post outside the electrical industry, and will leave the company on 31st August. **Mr. G. B. Russell** has been appointed home sales manager from 1st September and will retain his position as manager of the Contracts Department. **Mr. D. J. Hastings,** O.B.E., M.A., M.Am.I.E.E., M.I.R.E., will remain as export sales manager.

Mr. H. E. Cox, A.M.I.E.E., general manager of the Rugby Works of the British Thomson-Houston Co., Ltd., has joined the board of the B.T.H. Co. After being educated at the Harvey Grammar School, Folkestone, and Westminster City School, Mr. Cox received his early technical training at Finsbury Technical College. After service in the Bedfordshire Regiment he entered upon a testing course at the Rugby Works in 1919. He was later transferred to the Switchgear Engineering Department, Willesden, where he specialised in the design of oil circuit-breakers and bushings. In 1927 he was appointed chief designer.

Mr. H. E. Cox

In 1936 Mr. Cox was appointed superintendent of the Engineering Department and Drawing Office, and in 1946 he additionally took over the management of the Switchgear Works. He was appointed manager of the Rugby Works in 1955 and general manager in September last year.

As a further step towards establishing single-headed management for each of its Districts the South Wales Electricity Board has appointed four more district managers. They are **Mr. F. G. Copland,** B.Eng., M.I.E.E. (Cardiff District), **Mr. I. G. Evans,** A.M.I.E.E., A.M.I.Mech.E. (Swansea District), **Mr. W. A. Coggins** (Ebbw Vale/Bargoed District) and **Mr. A. C. Barrett,** A.M.I.E.E., A.M.C.T. (Llanelly District).

The two District organisations which have hitherto served the eastern and western sections of Cardiff are to be amalgamated so that the city will now be under one manager. The Ebbw Vale/Bargoed District will be formed by the amalgamation of the two separate organisations at present serving the eastern and western valleys of Monmouthshire. The new managers will take up their appointments on 1st September.

Mr. Copland has been engineer of the Board's Monmouthshire and Mid-Wales Area since March, 1957. Previously he held a number of engineering appointments in North-West England, the Isle of Man and in the former Gold Coast territory. He was development engineer to the North Western Electricity Board from 1950 until he joined the South Wales Board in 1957.

Mr. Evans has been commercial officer of the Swansea and West Central area since 1949. He commenced his service in the industry with the former municipal electricity undertaking at Rhondda in 1925 and before vesting date he was successively electrical engineer and manager of the former municipal undertaking at Portland and Pontypridd.

Mr. Coggins has been district engineer for Brecon and Llandrindod Wells Districts since September, 1949. Before vesting date he had held various appointments in the former Electricity Department of the Bedwellty U.D.C. since 1932.

Mr. Barrett has been district engineer for Pontypool since 1948. He commenced his electrical engineering career with Bacup Borough Council in 1932 and became electrical engineer and manager of the former Pontypool Electric Light & Power Co., Ltd.

Mr. F. G. Robinson, Associate I.E.E., who, as we briefly reported last week, has been appointed manager of the Twickenham and Richmond District of the South Eastern Electricity Board in succession to Mr. J. D. Parkinson, has been acting manager of the District. He received his technical education at Wimbledon Technical Institute before taking up a post with the Electrical Apparatus Co. in 1923. He entered the electricity supply industry in 1926 when he joined the engineering staff of Epsom U.D.C. as a mains assistant. In 1934 he was appointed mains engineer and eight years later was made chief assistant to the Council's electrical engineer. He continued in that post with "Seeboard" from 1948 to 1955 when he was seconded to the Surrey manager's staff for special duties.

Mr. F. G. Robinson

Mr. T. A. Crisp

Mr. T. A. Crisp, who has been appointed commercial officer of the Board's Surrey Sub-Area, has been commercial engineer of the Croydon and Purley District. He was educated at the Grammar School and Technical College, Lowestoft. Following a five-year training period with Lowestoft Corporation Electricity Department, he was appointed showroom superintendent in 1938. From 1940 to 1946 he served in the R.A.F. and on returning to Lowestoft became consumers' engineer. Mr. Crisp joined "Seeboard" in 1951 as consumers' engineer at Reigate and followed this with a similar position at Sutton District, from where he moved in April last to become consumers' engineer in the Croydon and Purley District.

Mr. J. H. Reyner, B.Sc., M.I.E.E., the author of the article "The Value of Adequate Instrumentation" published in this issue, has been well-known in the radio industry since the earliest days of broadcasting, when he was responsible for many of the popular designs of the period, including the "Solodyne" which was the first broadcast receiver to use a single tuning control. In 1927 he founded Furzehill Laboratories, Ltd., and began to produce electronic test equipment now in use throughout the world. During the war he collaborated with Smiths Aircraft Instruments in the development of automatic pilots and similar equipment. Mr. Reyner is the author of a number of textbooks, including "Modern Radio Communication," "Cathode Ray Oscillographs," and "Magnetic Amplifiers." He was editor of the I.E.E. Students' Quarterly Journal from 1930 to 1956.

Mr. J. H. Reyner

Mr. R. F. Mathieson, Associate I.E.E., has been elected chairman of Electrical Engineers (A.S.E.E.) Exhibition, Ltd., in succession to Mr. J. Flood, Associate I.E.E. Mr. Flood had held this appointment from the date of the incorporation of the company in 1953. Mr. Mathieson, a past-chairman of the A.S.E.E., was chairman of the Exhibition Organising Committee in

1957-58. He is London sales manager of the Electrical Apparatus Co., Ltd. He is succeeded as chairman of the Exhibition Organising Committee by Mr. G. H. Parker, Associate I.E.E., immediate past-chairman of the A.S.E.E.

Mr. R. J. Gresley has been appointed chief engineer in the power transformer division of Gresham Transformers, Ltd. Educated at Denbigh Grammar School, Mr. Gresley served an apprenticeship in Ferranti's Transformer Department from 1937 to 1942. Following war service with the R.A.F. as engineer officer, he has been concerned with transformer design and engineering with Ferranti, Ltd., for the past eleven years and for some time was chief engineer of the Distribution Transformer Department.

Mr. R. J. Gresley

Mr. C. A. Adams, B.Sc., F.Inst.P., chief of trials and safety of the United Kingdom Atomic Energy Authority Weapons Groups at Aldermaston, has been appointed chief nuclear health and safety officer of the Central Electricity Generating Board. Since leaving London University, Mr. Adams has been engaged on scientific research in Government research establishments, particularly in connection with the development of nuclear weapons. He was deputy technical director for the first British atomic weapon trial, and in 1953 acted as scientific superintendent for further trials. In the first two trials he worked under Sir William Penney, the trials director. In 1956 Mr. Adams was appointed scientific director for the Monte Bello tests and in 1957 acted as deputy scientific director under Sir William Cook for the "megaton" trial at Christmas Island. Later, in 1957, as director, he conducted a further series of tests.

Mr. J. B. Owen, A.M.I.E.E., has been appointed contracts officer, British Railways — Southern Region. Mr. Owen was educated at St. Edmund's School, Canterbury, and the Birmingham Central Technical College. He joined the G.E.C., Witton, as a student apprentice in 1932, and afterwards spent 14 months in the company's estimating department. In 1937-38 he was a sales engineer with Siemens-Schuckert (G.B.), Ltd., but returned to the G.E.C., serving in the contract department and later in the Research Laboratories, Wembley. In 1946 he joined the predecessors of the Southern Region, becoming assistant-general (new works) in 1949 and senior technical assistant (power supply) in 1951. In 1956 he was appointed new works engineer (power supply) in charge of the electrical fixed installations for the electrification of 250 route miles to the Kent coast.

Mr. J. B. Owen

Mr. H. B. C. Woodcock has been appointed a lamp applications engineer in the Midlands region (Birmingham) of Philips Electrical, Ltd. Mr. Woodcock received his early training with Siemens Bros., Ltd., and the General Electric Co., Ltd. He later became manager of the Electrical Department of Harris & Sheldon, Ltd., and was then for a number of years manager of the Lighting Division of Veritys, Ltd.

Mr. A. F. Street has been appointed director and chairman of the Micanite & Insulators Co., Ltd. Mr. Street, who is a solicitor and a director of Siemens Edison Swan, Ltd., and other companies of the Associated Electrical Industries group, has also been appointed a director and chairman of British Tego Gluefilm, Ltd., a wholly owned subsidiary company of the Micanite & Insulators Co.

Mr. A. F. Street

The British Transport Commission has appointed **Mr. F. T. Barwell,** Ph.D., B.Sc.(Eng.), M.I.Mech.E., A.M.I.E.E., senior principal scientific officer, Department of Scientific and Industrial Research, as electric traction engineer (research), Electrical Engineering Department, British Railways Central Staff. **Mr. H. L. Preston,** senior technical assistant (electrical multiple-unit equipment), becomes senior technical assistant (inspection).

Dr. Barwell commenced his training as a premium apprentice in the Chief Mechanical Engineer's Department of the Great Western Railway at Swindon in 1927. After experience in the test house and drawing office at Swindon, he studied railway motive power engineering at the City and Guilds College (Imperial College), South Kensington, during the tenure of a Whitworth Scholarship. Following study of electric railway work with the London Passenger Transport Board at Acton Works and Golders Green, he was awarded a Robert Blair Fellowship which enabled him to spend a year studying electric and diesel railway traction in Europe and North America. In 1939 he joined the scientific staff of the National Physical Laboratory. In 1948 he became head of the lubrication and wear division of the newly formed Mechanical Engineering Research Organisation. Dr. Barwell is the author of some fifty scientific and technical papers and of a book entitled "Lubrication and Bearings." He is a member of the Council of the Institution of Engineers and Shipbuilders in Scotland and hon. treasurer of the Whitworth Society.

Mr. H. L. Preston entered the service of the London Midland and Scottish Railway in 1923 and served his apprenticeship on the Liverpool-Southport and Euston-Watford electric lines. He was appointed draughtsman at Stonebridge Park in 1927, and after gaining experience in power station, substation and rolling stock work, was temporarily transferred to Manchester in 1931 to assist at the opening of the Manchester, South Junction and Altrincham electrification. Following subsequent appointments as foreman, he was appointed in 1939 acting resident engineer, Birkenhead North, in charge of the Wirral electrification, and in 1942 became foreman, Bury Car Shops. He was appointed car repair engineer, Stonebridge Park, in 1949, and in 1956 senior technical assistant (electric multiple-unit equipment) in the office of the Chief Electrical Engineer, B.T.C. Mr. Preston has served on several committees dealing with the technical, planning and organisational aspects of electrification.

Mr. C. E. Walters, sales manager of the Components Division of Sunvic Controls, Ltd., left recently for a four-week visit to South Africa where he will discuss marketing of the company's components and domestic products. **Major-General M. S. Wheatley** is at present in Canada in connection with Sunvic data handling equipment.

Mr. F. Geoffrey Marshall, M.I.E.E., informs us that he has recently resigned from the position of chief electrical engineer of the Ulster Transport Authority which he has held since the formation of the Authority in 1948. He is setting up an electrical agency in the Bristol area. Before his appointment with the Ulster Transport Authority Mr. Marshall held the positions of outside engineer, Siemens Brothers (1927-34); technical assistant, outdoor machinery department, L.M.S. Railways (1934-38); and electrical and signal engineer, L.M.S. (Northern Counties), Belfast (1939-48).

Mr. F. G. Marshall

Another two employees of the **Johnson & Phillips** organisation, on the attainment of fifty years' service, were presented by Mr. W. Glass, chairman of the company, with silver-mounted leather wallets each containing £50 in treasury notes. They are Mr. Stanley J. Jenkins, foreman of

the Upper Stores, and Mr. Walter L. Stevens, of the Transformer Department. Both Mr. Jenkins and Mr. Stevens retired on 1st August.

Members of the **Ipswich and District Electrical Association,** for their annual industrial visit, this year visited the Research Laboratories of the General Electric Co., Ltd., at Wembley. Parties were escorted round the laboratories, covering metallurgy, semi-conductor, infra-red development, lighting and other sections. The members were guests of the G.E.C. at luncheon, and a vote of thanks was extended to the hosts by Mr. A. White (chairman) and was responded to by Mr. N. L. Harris, head of the Information Department at the laboratories.

Mr. N. E. P. Harris, M.I.E.E., retired on 31st July from the position of deputy chairman and joint managing director of Bullers, Ltd., after having served with the company for fifty years.

The Eastern Area final of the **Electrical Industries National Golf Championship** was held at the Letchworth Golf Club on 30th July. Twenty competitors took part in perfect weather conditions, and the meeting was followed by a supper at which the area trophies were presented. The successful competitors, who now qualify for the national final at Wentworth on 29th September, were: Winner, Mr. J. L. Taylor (Leighton Buzzard); runner-up, Mr. S. J. Ball (Letchworth); and best scratch score, Mr. O. Robinson (Kettering).

Mr. John A. Hall has been promoted to Midland area manager of Courtney, Pope (Electrical), Ltd., at the recently opened branch of the company at 254a, Corporation Street, Birmingham, 4. For the past few years he has been in the London area as a technical sales engineer.

Mr. J. A. Hall

Mr. E. A. Mills, chairman of the London Area Committee of the **Electrical Industries National Golf Championship,** tells us that as a result of the Committee's last annual draw the Electrical Industries Benevolent Association has benefited to the extent of £700.

OBITUARY

Mr. John Henry Asdell, M.I.E.E., died on 29th July. He was secretary of the Birmingham Electric Club in 1930-31 and again from 1939 to 1946. He was president of the Club in 1935 and in recognition of his services he was made an honorary life vice-president in 1952. Mr. Asdell was intensely interested in education; he represented the Club on the Birmingham Technical College Advisory Committee and was actively concerned with the Club's scholarship. He was a member of the Court of Governors of Birmingham University.

He was formerly chief electrical engineer to T.I. Group Services, Ltd. Earlier he had been with Odeon Theatres and Parker, Winder & Achurch, Ltd.

Miss R. V. Norvick.—We regret to report the death, on 1st August, of Miss R. Vera Norvick, who was for many years assistant secretary of the Electrical Association for Women, and was closely associated with the late Dame Caroline Haslett in building up the Association. Miss Norvick was born at Nantyglo, Mon., and was educated at the Brynmawr (Brecon) County Secondary School. In the earlier part of her career she was a professional singer. At one time she was with the Briton-Ferry Steel Co., and then with the Hackney Electricity Department; she joined the E.A.W. staff in 1927. Among her duties with the E.A.W. she was especially concerned in the examination and diploma work for demonstrators, housecraft advisers and teachers; she was joint secretary of the Caroline Haslett Trust and assistant editor and advertisement manager of the *Electrical Age*, the Association's journal. She was a past president of the Central London Soroptimist Club and represented the E.A.W. on the Women's Advisory Committee and other committees of the British Standards Institution. The funeral took place at Golders Green Crematorium last Tuesday.

The late Miss Vera Norvick

Mr. Edgar George Sellers, who for the past six years was the managing director of the Selex Electric Co. (Kirkby), Ltd., of which company he was one of the founder members, died on 18th July. He was previously for many years sales director of Elexcel, Ltd. Mr. Sellers devoted much of his time to the Electrical Industries Benevolent Association.

"Son et Lumière" at Greenwich

The new display of *Son et Lumière* at Greenwich began its run last week. The spectacle is being presented by Atlas Lighting, Ltd., on behalf of the Ministry of Works, and can be seen each evening, except Sundays, until 11th October. Mr. Hugh Ross Williamson has re-written the script for this year's show and the cast is headed by Mr. Charles Laughton.

The most important British contribution to the art of *Son et Lumière* lies in the wide variety of light sources and in the methods of control. There are some 600 white and coloured fluorescent tubes, some of which are of specially high VHO light output and some have built-in reflectors. They will be used mainly for colour flood-lighting, for which they have important advantages. For example, by using dimming circuits and coloured tubes a wide variety of colour changes is achieved and the desired colours are obtained by an additive process as opposed to the subtractive process involved when incandescent lamps are used with coloured filters. Higher light levels can therefore be achieved with lower current consumption and much lower costs. Directional lighting will be produced by incandescent lamps ranging from a special 3,000 W mirrored lamp to a low voltage 150 W lamp only 50 mm in diameter yet capable of projecting light over a distance of up to a quarter of a mile.

The electronic lighting console gives the single operator fingertip control of all the 72 circuits to which the lamps are connected, and there are also 24 switched circuits and their controls for special effects. The colour changes are effected by special thyratron valves which ensure smooth yet positive colour blending.

The narrative has been recorded by E.M.I., Ltd., on dual-track tape and is reproduced from five sound sources to create convincing effects of moving sound and stereophonic music of high quality. The sound is distributed by one operator using quadrant faders.

The "Son et Lumière" spectacle at Greenwich

VIEWS on the NEWS

By REFLECTOR

AN item of interest in the B.B.C.'s South Eastern Regional News concerned the activities of the British Rubber Producers' Research Association. So that research can be carried out in this country into the properties of fresh latex, rubber trees are to be grown in a 25ft high greenhouse which the Association is building at Welwyn Garden City. It will be equipped with electric soil heating cables and special lighting, the Eastern Electricity Board being responsible for the installation. I am told this is the first experiment of its kind with rubber trees under these conditions, although it is not the first time they have been grown in this country.

* * *

Floor warming has been proved to be a good thing for humans; it should be even better for animals accustomed to tropical conditions. It has recently been applied in the Eastern Electricity Board's area for keeping up the temperature in a pool occupied by two young alligators. This pool, at Great Yarmouth, has been equipped with 700ft of insulated wire, giving a loading of 3 kW, covered by the usual thin screed of sand and cement. Under thermostatic control the temperature is kept between 60 and 70 deg F. The alligators are reported to be perfectly content with the arrangements.

* * *

Some time has elapsed since my last reference to fish. Now the *Manchester Guardian* has re-drawn my attention to the subject. In an article in that newspaper Hamish Mackinven describes work carried out at the brown trout research station at Pitlochry, Perthshire. It has been proved that brown trout, like salmon, migrate but return to spawn in the stream of their birth.

> "The general sampling and census of the trout population in the lochs were obtained by fishing the streams with nets and electric fishing apparatus. A simple portable petrol engine generator was used to deliver unsmoothed d.c. current. The negative electrode, constructed of "expanded" aluminium, was made to stretch from bank to bank of the streams, similar to a telescopic fence, and resting on the bed of the streams. This proved to be an efficient stop net. A specially designed portable positive electrode, mounted on a long handle, was used to search beneath banks, inside culverts and such-like hidey-holes."

The work of the research station, thus aided by electricity, is resulting in happier—and therefore bigger and better—trout.

* * *

Not many years ago there was a serious shortage of generating plant here, largely because successive Governments could not be persuaded that the growth of the electricity load would quickly demand more capacity. In New Zealand there is now a similar shortage and again the Government there is blamed for it by *Live Lines*, the journal of the Electricity Supply Authorities Association of New Zealand. After referring to the "repeated and totally unnecessary power restrictions which plague this country year after year with monotonous regularity," the journal says:—

> "One wonders whether the Government is yet seized with the cost to the country of installing dual water heating systems, alternative cooking and space heating methods, as well as the use of overseas funds for the importation of the necessary fuels. These funds would be better spent in providing an adequate generating system. At present the electrical industry wastes its energies in seeking better and better ways of restricting consumption of the inadequate supplies of power in the North Island when there is a surfeit of electricity in the South. A Government announcement of the linking of the two islands by the Cook Strait cable would be very welcome at this stage."

My readers may recall that the *Electrical Review* recorded in May that a British cable company had been asked to lay a trial length of cable in Cook Strait.

* * *

It is reported by the *Evening Standard* that a new Finnish Club in London will have sauna baths—a feature of life in Finland. After noting that, to conform with English "modesty," there will be men attendants instead of the customary female ones, the newspaper says:—

> "In Finland sauna baths are steam-heated. In Haymarket, they will be heated by electricity. Another important difference: Finns at home run into the snow after a sauna and plunge naked into a snowdrift. This is hardly likely in Haymarket."

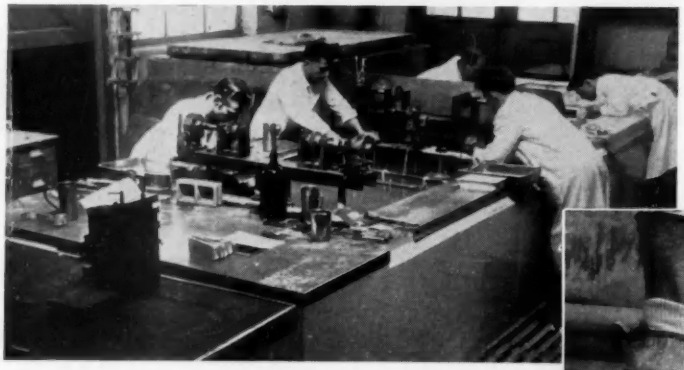
If it is unlikely merely because of the absence of snow surely it could easily be arranged to produce some snow electrically to complement the electric heating.

* * *

From time to time authorities inviting tenders complain that firms which respond quote identical prices. On the other hand "free" competition sometimes results in great disparity in prices for the same job. Conditions seem to have been the same fifty years ago. I have been looking at reports in the *Electrical Review* of 7th August, 1908, of quotations received by London municipalities. For instance six tenders were received by the St. Marylebone Borough Council for l.v. paper insulated cable. Four prices were identical while the other two (also putting forward parallel figures) were not much above. For additions to a low-voltage switchboard the St. Pancras Electricity Committee received fifteen offers. The four lowest were within two or three pounds of one another; then there was a steady rise until the last two figures were twice those of the lowest tenderers.

PRECISION CASTINGS

A TECHNIQUE for the manufacture of precision castings using frozen mercury is being employed by Sankey-Telcon, Ltd., Telcon Works, Manor Royal, Crawley, Sussex. The company is the sole operating licensee of this process outside the United States. It was formed approximately three years ago and after a preliminary development period has been in production for about eighteen months in its new factory of 6,000 sq ft.



Left : The pattern and mould making shop and (below) dipping the frozen mercury patterns into the ceramic to form the moulds

The "Mercast" process of precision casting employs mercury as the disposable pattern material. A steel or aluminium die which is made in sections so that the pattern can be removed without distortion, is filled with mercury and immersed in a refrigerated acetone bath at about −65 deg C. The frozen mercury pattern is extracted from the die and dipped into a zircon-base ceramic. The mercury is then allowed to melt, at room temperature, leaving a ¼in thick ceramic mould. The mould is fired to strengthen it and is used in various casting methods. A new mould is required for each individual casting.

High quality castings for the aircraft, electronics and gas turbine industries are being made. Castings of better quality and greater intricacy can be produced by using mercury as the pattern material than those from wax or plastic patterns. A general guide to tolerances obtainable with the "Mercast" process is ±0·003in per inch for most alloys. Many types of waveguides, including tight bends, horns, etc., for such equipment are being regularly manufactured.

ELECTRIC ROAD HEATING

THE Road Research Board has been carrying out experiments in electric heating to prevent ice formation on roads during the past two or three years. The Board's report for 1957 (H.M. Stationery Office, 5s 6d) says that a further experiment has now been made on a local road carrying moderately heavy traffic. Two sections each 100ft long contain electrically heated grids embedded between the asphalt base and wearing courses. In the first section the heating grid consisted of insulated resistive cable connected directly to the 240 V mains and was designed to give an output of 5 to 6 W/sq ft. Sheets of expanded metal were used as heating grids in the second section and they were fed with current from a 20 kVA transformer having an adjustable output voltage between 10 and 30. The power output of this heating grid could therefore be varied between 1 and 10 W/sq ft.

Current was supplied to both sections at off-peak periods and was controlled by a thermo-hygrostat. This was designed to switch on the current (a) when the road surface was wet and had a temperature below a pre-set value in the range +1 to +4 deg C, and (b) when the road surface was dry and had a temperature below pre-set values in the range +1 to +4 deg C and 0 to +3 deg C below the air temperature.

The thermo-hygrostat consisted of an arrangement of transistors and relays operated by thermistors used as temperature-sensitive elements. The wetness of the road surface was detected by the electrical resistance across two copper strips embedded in it. This arrangement satisfactorily combated all the icy conditions that occurred during the relatively mild winter of 1956-57. To arrest the most rapid fall in the temperature of the road surface likely to occur on a clear cold night required power at about 8 W/sq ft.

These electrically heated road sections are providing factual data on running costs, while much information concerning the capital costs of such installations is readily available within the electrical industry. The elimination of icing at particular sites is not only a matter of obvious convenience to road users and to the highway engineer who is responsible for keeping the roads open to traffic but, when consideration is given to the costs of accidents and of the delays caused to traffic at such sites, electric heating may well prove an economic procedure, the cost of which is far exceeded by the savings it produces. It is proposed to obtain data regarding these costs together with the cost of applying salt and grit in an effective way.

The Laboratory has collaborated with the engineer of a Midland city in designing electrically-heated concrete ramps leading from road level to a car park on the roof of a covered market, a site where, obviously, ice on the road surface would be dangerous. Part of the heated area will have thermal insulation on the underside.

The report also states that the standard of street lighting has strengthened the conclusion that modern lighting tends to reduce the frequency of night accidents.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Inadequate Wiring Systems

FOR some years I have been propounding locally my conviction that one 3 kW circuit is entirely adequate for every domestic room but the kitchen, where a cooker circuit will be needed in addition; i.e. the average bedroom and the living room need about 8 to 12 outlets but the total load in each room will not exceed 13 A.

I agree strongly with Mr. Raynor's proposals (*Electrical Review*, 25th July) except to ask that there shall be no more new shapes and sizes of plugs. Why not 2 A 3 pin plugs on 3/·029 protected by a 5 A fused point-box at the 13 A socket?

But let us not be too hard on the gentle giant "I.E.E. Regs." See, with the timely aid of the National Inspection Council, even the "impractical" old 404J (207G) is now being honoured in practice!

Crediton, Devon. E. J. H. MARSHALL,
Branch Manager,
South Western Electricity Board.

MR. B. RAYNOR wonders what are the objections to his proposed wiring system.

Having decided that in the parlour the only sensible position for the solitary 13 A socket is on the right-hand side of the fireplace, Mrs. A has it so installed and (if she does not change her mind about the positions of the furniture) this gets by: that is until Mr. B buys the house and insists on having his bookcase just there. This provides work for electricians but Mr. B is not amused as his previous house had those ring circuits with sockets galore so that if furniture obstructed one or two there were plenty still accessible.

It had hardly cost him any more to install—the 7/·029 cable had been run round each room (just like Mrs. A's 3/·029) and when he had wanted an extra socket it had only been necessary to cut the ring and connect one in. The plugs also were good—plenty of wiring space and a proper grip at the entry and if they were a little large compared to some of the flexes, well one never had to carry them very far. And how easy to replace a fuse.

Mrs. A confessed that she had found her system a bit inconvenient. On cold days she could not have her fire on while she was ironing and the kettle had to be boiled in another room.

Mitcham, Surrey. H. C. COOPER.

Incentive on the Railways

ELECTRIFICATION is counted upon as being the most important single factor in the British Railways modernisation programme that will enable the system to attain financial solvency. In these circumstances it must be of the utmost importance to the railways that their professional electric traction engineers shall be of the very best. What therefore is being done to attract young electrical engineers of the highest quality to this branch of engineering?

The ultimate prospect in a matter of this kind is vitally important, but to judge by the recent reorganisation of the engineering staff, it would seem that the reorganisers have not given adequate consideration to this psychological factor because in each Region there will only be, as the chief engineer officers, the chief mechanical and electrical engineer, the chief civil engineer and the signal engineer. In view of the forthcoming great importance of electric traction there ought surely to have been a place for a chief electrical engineer. A properly equipped electrical engineer has received as an essential much training in mechanical engineering; electrical engineering is not essential in the making of a mechanical engineer, but it does sometimes happen that a mechanical engineer with some electrical knowledge enjoys the title of mechanical and electrical engineer, reliance being placed on a good electrical engineer assistant for deficiencies on the electrical side.

Greatly in contrast, Mr. R. R. B. Brown, the chairman of the Southern Electricity Board, in considering the problem of filling higher management posts in Electricity Boards, has rightly concluded that the best material can only be recruited if careers with the Boards are made attractive, with training and advancement prospects available that lead to top level positions. As there is no place in the chief officer class (engineering) in B.R. Regions for the electrical engineer, prospects are not so good as they ought to be and as the importance of railway electrification warrants. Mr. Brown's very sound views need applying here.

TRACTOR.

Development in Cyprus

IN your editorial of 18th July you were kind enough to mention my name in connection with the rapid electrical development of Cyprus. The good progress has been due almost entirely to the keenness and drive of the general manager, Mr. J. W. Morison, and his predecessor, Mr. J. O. Hall, with their team of engineers and technicians, Cypriot and expatriates, who have really achieved surprising results in a short time, in spite of well-known difficulties.

H. F. CARPENTER.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton	£180 0s 0d
COPPER, H.C. Electro	ton	£209 10s 0d
Fire Refined 99·70%	ton	£208 0s 0d
Fire Refined 99·50%	ton	£207 0s 0d
COPPER Tubes	lb	2s 0½d
Sheet	ton	£238 10s 0d
H.C. wire and strip	ton	£255 15s 0d
LEAD, English	ton	£72 0s 0d
Foreign	ton	£71 0s 0d
MERCURY	flask	£79 0s 0d
TIN, block (English)	ton	£731 0s 0d
ZINC, G.O.B. Foreign	ton	£64 15s 0d
Electrolytic	ton	—
BRASS Tubes (solid drawn)	lb	1s 7½d
Sheet	ton	—
Wire	lb	2s 5½d
PHOSPHOR BRONZE Wire	lb	3s 9½d
PLATINUM	oz	£23 5s 0d
RUBBER, No. 1 R.S.S. spot	lb	23½d—23½d

INDUSTRIAL NEWS

Electricity Supply Organisation

The *Electrical Review* of 14th March last contained a coloured chart showing the structure of the reorganised electricity supply industry with the names of the members of the Electricity Council and Central Electricity Generating Board and the chief executive officers of the Board.

This chart has now been revised and brought up to date and copies are available from the *Electrical Review*, Dorset House, Stamford Street, London, S.E.1, at 6d each, plus 2d postage.

Large Fluorescent Lighting Contract

A contract for the supply of 10,000 fluorescent lighting fittings has been awarded to the General Electric Co., Ltd., by the Ford Motor Co., Ltd. The fittings consist of twin-tube vitreous enamelled trough reflectors with switchless start gear, for suspension from about 110,000ft of specially designed G.E.C. cable trunking. They will be installed in the body assembly building now being erected for the Ford Motor Co. at Dagenham.

Research Programme Control

The Council for Scientific and Industrial Research announces a change in organisation affecting two D.S.I.R. laboratories. Small Steering Committees are being set up to bear responsibility for the research programmes at the new Warren Spring Laboratory, at Stevenage, and at the recently re-named National Chemical Laboratory, at Teddington.

Under the former system, Research Boards, which the Steering Committees replace, were responsible to the Research Council, but there was not necessarily any common membership. It is an essential feature of the new arrangement that the Steering Committees are full committees of the Research Council and that there will be a direct link between the two bodies, because the chairmen of the Committees are members of the Council.

Sir Harry Jephcott is chairman of the Warren Spring Laboratory Steering Committee and Professor C. E. H. Bawn will be chairman of the National Chemical Laboratory Steering Committee which will assume responsibility from 1st October.

Trade Prospects in Mexico

There is plenty of scope for enlarging trade between Britain and Mexico, and British business men who visit Mexico will see for themselves the opportunities that exist and the interest of the Government and private industry in increasing financial and technical co-operation between the two countries. This was stated last week by the Mexican Minister for Economy, Dr. Gilberto Loyo, at the end of his visit to this country at the head of a trade mission. Although Britain is at present second in the list of European countries trading with Mexico, she supplies only 3 per cent of Mexico's total imports.

The mission had discussions with the London Chamber of Commerce, and among the orgapisations visited were Standard Telephones & Cables, Sunvic Controls, the B.B.C. and Associated Rediffusion. The biggest impression was made by Calder Hall. Mexico has only limited hydro-electric resources and there are difficulties in establishing thermal stations in certain regions. It also prefers to sell its oil for foreign currency rather than burn it in power stations. Dr. Loyo said that Mexico was considering buying a nuclear power station and the Calder Hall type of reactor was particularly attractive because it used unenriched fuel and would enable Mexico to exploit her own uranium resources without heavy capital expenditure on processing plants.

Ice Cream Manufacture

In our issue of 27th June we published an article on ice cream manufacture at the Lyons Maid factory of J. Lyons & Co., Ltd., at Greenford, Middlesex. At this new factory the mimic diagrams for the main power distribution and the control panels for Polar Maid plants 1 and 3, Zippy plants 1, 2 and 5 and surge pump were manufactured and installed by Thermocontrol Installations Co., Ltd.

Indian Steelworks Progress

Work is well up to schedule at the Durgapur steelworks which the Indian Steelworks Construction Co. (ISCON) is building for the Indian Government. This was announced by the managing director of ISCON, Mr. R. J. Barritt, at a conference in London last week attended by Mme. Pandit, the Indian High Commissioner.

It is expected that the first stage of the project will be completed by November of next year and that the whole plant will be in operation by August, 1961. The steelworks which the Germans and Russians are building will be completed later this year and next year, respectively. Each of the three plants is rated at one million tons annual capacity, but work on the Russian and German plants started earlier.

ISCON is a consortium of 13 British firms, of which four—the British Thomson-Houston Co., Ltd., the English Electric Co., Ltd., the General Electric Co., Ltd., and the Metropolitan-Vickers Export Co., Ltd.—are supplying electrical equipment. Half the value of the £100 million contract represents British production (f.o.b.) and half Indian work.

Crompton Lamps in Ireland

The full range of popular size Crompton g.l.s. lamps are now being manufactured in Ireland for the first time and are available from the company's agents, Nugent & Cooper, Ltd., Nuco House, Lower Abbey Street, Dublin. Both clear and pearl lamps, with ratings between 15 and 150 W and for voltages from 200 to 260 V, are being produced by the Irish factory and this range will be extended from time to time to include all types of lamps in general demand. Material for an advertising campaign can be obtained from Nugent & Cooper.

Fluorescent Lamp Improvement

Philips Electrical, Ltd., announce a significant new increase in the light output of their fluorescent lamps. In the case of the more common ratings, this means an initial increase of between 10 and 15 per cent, associated with improved lumen maintenance throughout lamp life.

This development arises from a new technique in the production and application of the phosphor coating. Only the total quantity of light emitted is affected; the colour quality remains unchanged.

The first colour to be made available through this new technique is the "cool white" ("daylight") and, in the case of the 4ft 40 W rating, the new lumen output is 2,800 lumens. This represents an efficiency of 70 lumens/watt—claimed to be a record figure for a "white" light source. The next colour to be made by the new process is the "warm white," and it is hoped to extend it to other colours in due course.

	80 W 5ft	40 W 4ft	30 W 3ft	20 W 2ft
1957/1958 values	4560	2440	1710	1000
New values	5100	2800	1980	1080

The table shows the initial increases in lumen output for the more common ratings of switch-start and instant-start lamps. Increases will also be declared for Philips "Reflectalite" fluorescent lamps with internal reflector.

New A.D.A. Publications

The Aluminium Development Association, 33, Grosvenor Street, London, W.1, has issued a new directory of members, showing the names and addresses of the member companies, together with corresponding details of

administrative and sales offices. It also comprises a guide to the products available, which are indexed for ready reference.

The former list of publications, comprising information bulletins on practice, application brochures on uses in specific fields, and research reports, has now been amplified by a new section named "the Symposium Series," consisting of six volumes containing papers and discussions on various aspects of aluminium practice and use, most of which arise from events sponsored and organised by the A.D.A. The last volume to be published is that dealing with the symposium on "Aluminium and its Alloys in Electrical Engineering" (May, 1957) and to this will be added in the next edition the proceedings of the symposium on "Aluminium in Packaging" held last June. The list shows 23 published information bulletins, 11 applications brochures, 34 research reports and 72 reprints.

The general arrangement of the list of films, film strips and wall charts, in which nearly sixty sound films (16 mm) available on loan are classified under production, working operations, joining and applications, has been preserved in this edition. Particulars are also given of 35 mm film strips. The wall charts, together with accompanying teachers' notes, provide teachers' aids on aluminium — production, aluminium alloys, preparation and properties, aluminium in everyday use, and production of castings.

Ashford Common Works

The new London water filtration pumping station of the Metropolitan Water Board at Sunbury-on-Thames was opened last Thursday. Mr. R. J. Buckingham, chairman of the Board, performed the opening ceremony and unveiled a commemorative plaque. After the ceremony Mr. Buckingham started up the three gas turbine-driven alternator units and the large electrically driven pumping sets.

The works, which have cost over £5 million, will have a capacity of 90 million gallons of water per day. The main purpose of the works, which occupy a site of 125 acres, is to provide additional filtered water to cope with future developments.

Clean Air Act

A new handbook on the provisions of the Clean Air Act which came into full operation on 1st June has been published by the Federation of British Industries, entitled "A Guide for Industry to the Clean Air Act, 1956" (F.B.I., 21, Tothill Street, London, S.W.1, price 4s). It brings up to date the Federation's previous publication on this subject and includes the regulations which the Minister was empowered to make under the Act. Intended as a working manual for the information of works managers and engineers, the booklet is divided into three parts; the first, on how to combat smoke, the second on how to combat grit and dust, and a third miscellaneous section. Its various appendices include the use of the Ringelmann Chart; smoke density indicators; description of dust-arresting equipment; relevant British Standards; a list of relevant Statutory Instruments; and the names of manufacturers of the various types of equipment generally required.

Hardman's display at the Manchester electronics exhibition

B.S.I. Certification Mark

Nearly 1,500 manufacturers licensed to use the "Kite mark" on their products are included in two lists published by the British Standards Institution, 2, Park Street, London, W.1—at 2s each. List "A" covers a wide range of goods supplied by one section of industry to others and it includes a number of electrical items such as lamps, switchgear, motors, transformers, h.d. copper wire, h.v. bushings, arc welding equipment, electric fences and concrete street lighting columns.

List "B" relates to consumer goods and among the items are g.s. electric lamps and electric blankets.

Batti-Wallahs' Society

The *Cutty Sark* now belongs to the nation, but during the course of her seagoing life she was for a time owned by a Portuguese shipowner and could have been lost to this country. At last week's luncheon of the Batti-Wallahs' Society, Sir Roy Gill, master of the *Cutty Sark*, gave an absorbing account of her career, first as a China tea trade clipper, then as an Australian wool trade clipper and finally as a training ship.

In accordance with custom there will be no luncheon of the Society this month; the next luncheon will be on Thursday, 25th September, when the guest speaker will be Mr. James Laver.

Electronics Display at Manchester

The Northern Division of the Institution of Electronics recently held its thirteenth annual exhibition and convention at the Manchester College of Science and Technology.

At the exhibition Hardman & Co., Ltd., of Rochdale, arranged a comprehensive display of equipment, a photograph of which we reproduce.

Isle of Wight Television

Full power test transmissions from the Independent Television Authority's new station at Chillerton Down, in the Isle of Wight, began on 1st August. They will be sent out from 10 a.m. to 10 p.m. on Mondays to Saturdays until the formal opening of the station for programme transmissions on Saturday, 30th August.

Locomotive Equipment Contract

British Railways has placed a further contract with the British Thomson-Houston Co., Ltd., for eighty-four Type 2 diesel-electric locomotive power equipments. This follows two previous orders placed with the company covering similar equipments for a total of thirty locomotives; the mechanical parts for all these locomotives are being built in British Railways workshops. The locomotives will be used for mixed traffic duties in the Eastern and North-Eastern Regions and are suitable for fast freight and passenger services. They are arranged for operation in multiple-unit if required. The power equipment includes a Sulzer diesel engine of 1,160 h.p. which drives the B.T.H. traction generator. Power is transmitted to the driving wheels by four axle-hung, geared traction motors.

Welding Conference

The development of welding technology and its application have been given a tremendous impetus in recent years by the evolution of the atomic energy programme. To avoid overlapping research and development, the International Institute of Welding was formed over ten years ago. It is undoubtedly significant of the indispensable part now played by welding, that the tenth Annual Assembly of the I.I.W., held this year in Vienna during the first week in July, attracted the largest number of delegates (810) yet

Brigadier Sir Lionel Harris, Engineer-in-Chief of the General Post Office, laying the foundation stone of new electronic telephone switching laboratories at the Beeston, Nottingham, factory of Ericsson Telephones, Ltd. When completed the building will have cost a quarter of a million pounds

enrolled. The membership of the I.I.W. is formed from fifty-eight member societies drawn from twenty-seven countries, including Russia. The British delegation to the Vienna Assembly numbered forty-four.

It has been customary in recent years to hold an open technical session as part of the programme of I.I.W. assemblies. In Vienna, papers at this session, which numbered thirty-two, were on the general theme of "Welding in the Chemical Industry." Four papers of United Kingdom origin were presented. The only way in which the activities and findings of the International Institute are made manifest to the industry is through the publication of documents. In some cases, the publication is undertaken by the International Institute. The alternative procedure adopted is the circulation of approved reports and documents to the various member societies in all countries with the request that the documents be published through their own channels.

Hospital Switchboard Installation

Astral Switchgear, Ltd., has recently supplied to the Baldovan Mental Institution, Dundee, the main switchboard controlling power services to the wards, road lighting, kitchen, workshops, living accommodation, etc. The company's patented cubicle construction was used for the board, which carries a total of 15 fused switches in 500, 300, 160 and 60 A sizes, as well as the necessary metering, time switch, and contactor. Because of limited access to the front of the board, all switch handles are removable, and in order to facilitate installation, there are arrangements for breaking down the board into two sections. Special plinth arrangements were devised to suit the existing cable trench. The consultants for the project were Ian Hunter & Partners, Edinburgh, and the electrical contractors were Sturrock Power Installations, Dundee, whilst the overall direction of the scheme was under the supervision of the regional engineer, Eastern Regional Hospital Board (Scotland), Dundee.

Nigerian Radio Communications

Marconi's Wireless Telegraph Co., Ltd., has been awarded two further large contracts by the Nigerian Posts and Telegraphs to extend communications in the area of the Nigerian Cameroons. For this purpose fourteen multi-channel v.h.f. terminal equipments, type HM100, and seven multi-channel repeater equipments are to be supplied, together with their associated aerials. The value of the contracts is approximately £36,000.

Russians at Boiler Works

Four Russian industrial technicians, headed by Mr. V. I. Baranov, deputy director, Department of Turbine and Boiler Construction and a State Planning Committee member of the Russian Soviet Federal Socialist Republic, visited the Wolverhampton works of John Thompson, Ltd., on 23rd July. They were met by Mr. J. H. N. Thompson, joint managing director of the company. The party is visiting some British power stations and the works of some of Britain's leading manufacturers of boiler plant.

Later in the year the Water Tube Boilermakers' Association, of which Sir Edward Thompson, J.P., chairman of John Thompson, Ltd., is a past chairman, is to send a delegation to Russia.

National Power Farming Conference

The 1959 National Power Farming Conference will be held at Harrogate from 10th to 12th February. The organisers are offering a cash prize of £50, plus an all-expenses-paid trip to the conference, for the best paper describing: "How I Arrange Men and Machines for High Production at Low Cost." The theme of the conference, which is being organised by *Practical Power Farming* and *Farmer & Stock-Breeder*, is "Machinery and Men." Further details of the conference and the competition can be obtained from the organiser, National Power Farming Conference, Dorset House, Stamford Street, London, S.E.1.

Vienna Autumn Trade Fair

The Birmingham Engineering Centre is exhibiting at the Vienna Fair where, by arrangement with the Board of Trade, the Centre's stand in the British Pavilion will handle all engineering inquiries received at the adjacent official Board of Trade display. The stand will also display a limited number of products. Firms interested in investigating prospects, consolidating an already established position, or interested in appointing agents in the Austrian market are invited to obtain further details from the general manager, Birmingham Exchange and Engineering Centre, Stephenson Place, Birmingham, 2.

Price Reductions

Dale Electric (Yorkshire), Ltd., announces that it has reduced the prices of its range of petrol and diesel generating plants. The range covers petrol units from 240 W up to 3,000 W and diesel units from 1,250 W up to 200 kW.

National Industrial Safety Week

The Royal Society for the Prevention of Accidents has adopted the slogan "Extra care stops falls" for this year's National Industrial Safety Week, which is to be held from 29th September to 4th October. To assist managements in organising their own campaigns during Safety Week, the Society has prepared an attractive range of publicity material built round a figure called "Humpty Bumpty," who sits on a wall, but instead of falling, sits tight with a cheerful smile. As a further encouragement to workers to interest themselves in the campaign, the Society has prepared a special poster slogan competition for which £100 is offered in prize money.

Preservation of the Countryside

The national conference of the Council for the Preservation of Rural England will be held at the Town Hall, Cheltenham, from 16th to 18th October.

Change of Address

The head office of Incorporated Plant Engineers has been moved from Solihull, Warwickshire, to 2, Grosvenor Gardens, London, S.W.1 (telephone: Sloane 0469).

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 16th August:—

HELIARC. No. 773,816. Class 9. Electric arc cutting apparatus and parts.—Union Carbide Corporation, New York, U.S.A. Address for service, c/o Marks & Clerk, 57-58, Lincoln's Inn Fields, London, W.C.2.

LEERASER. No. 774,484. Class 9. Electrical demagnetising apparatus and parts.—Leevers-Rich Equipment, Ltd., 78, Hampstead Road, London, N.W.1.

TRUNDLEWATT. No. 776,345. Class 9. Electric cables mounted on reels or on drums and sold complete.—Vectronic Developments, Ltd., Ling House, Dominion Street, London, E.C.2.

TRIXTEREO. No. 776,530. Class 9. Sound recording and reproducing apparatus and instruments; radio, telephonic, telegraphic and television apparatus and instruments, etc.—Trix Electrical Co., Ltd., 1-5, Maple Place, Tottenham Court Road, London, W.1.

LYLUX. No. 774,952. Class 10. Blankets and pads for warming and airing beds, all being electrically heated goods.—H. J. Baldwin & Co., Ltd., Baldwin House, 132, Arkwright Street, Nottingham.

More Power from Peat

NEARLY 30 PER CENT OF TOTAL OUTPUT IN IRELAND

EXPLOITATION of native fuel resources is one of the major aims of the Electricity Supply Board of Ireland. Initially this was confined to hydro-electric development but more recently the country's extensive peat deposits have provided a useful source of power. The first peat-fired station came into operation in 1950 at Portarlington using machine-won sod turf. Since then other stations have been commissioned, the latest of these being designed to burn milled peat.

In its report covering the year ended 31st March last the Board shows that peat-fired stations accounted for 29 per cent of the total electricity generated, including 7 per cent produced in milled peat stations. Of the remainder, hydro-electric stations were responsible for 40 per cent of the output and oil or coal fired stations for 31 per cent.

Plant Capacity

The installed capacity of the Board's generating stations at 31st March was 649·5 MW (steam plant 434·5 MW and hydro plant 215 MW). These figures include 95 MW of steam plant in Pigeon House, Dublin, which is now operated only as a stand-by station. New steam stations at Arigna (15 MW, coal-fired), Lanesborough (20 MW, peat-fired), Rhode (40 MW, peat-fired) and Bellacorick (40 MW, peat-fired) are at present under design or construction and will increase the steam plant capacity to 549·5 MW. This, with the 4 MW of hydro plant under construction at Clady, will make the total installed capacity 768·5 MW.

Performance figures are given in an appendix to the report from which the accompanying data relating to steam stations have been abstracted. The main sources of hydro-electric power were the Ardnacrusha (Shannon) station, which generated 310 million kWh at a cost of 0·306d per kWh sent out (plant load factor 41·6 per cent) and the two Erne stations, Cliff and Cathaleen's Fall, which generated 79 million and 197 million kWh respectively (with load factors of 45·2 and 49·9 per cent) at a combined cost per kWh sent out of 0·397d. Altogether 1,775 million kWh was generated compared with 1,696 million in 1956-57. Hydro-electric stations produced 702 million kWh and peat stations 525 million.

Revenue amounted to £12,947,602 (against £11,601,754), with working expenditure of £6,841,176 (£6,211,874). After providing £3,268,110 (£2,739,034) for interest charges, £2,347,000 (£2,012,000) for plant renewal and £685,899 (£636,955) for capital redemption there was a deficiency of £194,583 which was reduced to £180,017 by the £14,566 profit from the merchandise and installation accounts. The £124,851 balance from 1956-57 with £166,502 set aside in earlier years for potential income tax liability and not now necessary absorbs this deficiency and leaves sufficient to write off £72,439 stock issue flotation costs and to cover £16,551 in respect of fishery losses. A sum of £22,346 is carried forward.

The value of plant brought into commission was £12,038,404 of which £3,384,347 related to rural electrification. In addition, expenditure of £4,274,402 was incurred on new capital works still under construction.

Trading conditions last year were difficult but the Board says that a recovery in sales in the second half of the year reflected the improvement in the general economic situation. An analysis of the 1,425 million kWh sold shows that the rate of expansion for the year was 5·3 per cent (compared with 3·5 per cent in 1956-57). Supplies to domestic consumers rose by 7·5 per cent to 611 million kWh and motive power sales by 2·3 per cent to 442 million kWh. At the end of the year consumers numbered 570,345, an increase of 22,435. Of the new consumers 17,725 were in rural areas. It is pointed out that the average price of electricity remains relatively low being still only 2·17d against the 1939 figure of 1·47d.

Work under the rural electrification scheme has progressed so rapidly that 75 per cent has now been completed. The remaining 25 per cent covers sparsely populated areas and consequently further development,

PERFORMANCE OF STEAM STATIONS IN 1957-58

Station	Location	Installed Capacity kW	kWh Sent Out Millions	Plant Load Factor %	Fuel Type	Total Fuel Used Tons	Total Fuel Cost £	Fuel Cost per kWh Sent Out d	Total Cost per kWh Sent Out d
Portarlington ...	Co. Laoise ...	25,000	130·0	63·2	Sod Peat	(a) 157,700	399,272	0·737	1·113
Allenwood ...	Co. Kildare ...	40,000	216·0	65·9	Sod Peat	(a) 262,500	736,718	0·818	1·140
Ferbane	Co. Offaly ...	60,000	123·0	35·7	Milled Peat Oil	(b) 235,000 1,300	293,788	0·573	1·243
Cahirciveen ...	Co. Kerry ...	5,000	20·1	17·4	Sod Peat	32,130	77,851	0·928	2·010
Miltown-Malbay ...	Co. Clare ...	5,000		29·5	Sod Peat				
Screeb	Co. Galway ...	5,000		18·8	Sod Peat				
Gweedore (d) ...	Co. Donegal ...	5,000		—	Sod Peat				
North Wall ...	Dublin ...	44,500	41·6	16·3	Oil	15,900	135,772	0·783	2·167
Ringsend	Dublin ...	90,000	273·7	36·9	Coal Oil	38,700 68,100	774,180	0·679	1·221
Marina	Cork	60,000	193·4	38·8	Coal Oil	33,200 44,900	610,488	0·757	1·237
Pigeon House (c)...	Dublin... ...	95,000	0·7	—	Coal Oil	2,100 800	21,885	—	—

(a) Portarlington and Allenwood peat figures are for equivalent standard fuel of 30 per cent moisture content. (b) Ferbane peat figures are for equivalent standard fuel of 55 per cent moisture content. (c) Pigeon House used only for stand-by. (d) Gweedore was commissioned for part of the last month of the year only.

without a subsidy, will be still more uneconomic than for the areas already completed. It is estimated that the annual loss per area will be about £3,000. For the past year the rural revenue account shows a loss of £552,197 and the report adds "The financial burden which has been thrust on the Board by the retrospective removal of the subsidy must be regarded as inequitable, and strong representations have been made for some relief. In some countries work of this nature has been rendered possible only with State aid." Since the end of the financial year it has been intimated to the Board that the subsidy will be restored in respect of areas yet to be developed.

Of the total areas in the country 772 (96 per cent) have been canvassed, 639 selected for development and 603 completed. During the year 60 areas were completed and 17,725 consumers connected, bringing the total rural consumers to 215,243. A further 36 areas are under construction or selected for development. The total value of materials used was approximately £1,490,000 of which 69 per cent was obtained from home manufacturers.

The year generally was marked by a curtailment in the sales of appliances the value of which was about 13 per cent below that for 1956-57, largely owing to import levies and to the fact that the grant for farm water supplies was not restored until August, 1957. From September onwards there was a marked improvement and there are indications that the farmer is becoming more aware of the advantages of electrically driven farmyard appliances.

TRAWSFYNYDD NUCLEAR STATION

THE Minister of Power, Lord Mills, after consultation with the Minister of Housing and Local Government and Minister for Welsh Affairs, has given his consent to the construction by the Central Electricity Generating Board of a nuclear power station at Trawsfynydd, Merioneth, and to the erection of 275 kV overhead transmission lines to connect the station with the pumped storage scheme at Tan-y-grisiau, and with Connah's Quay.

In a letter informing the interested parties of the Minister's decision it is recalled that the C.E.G.B. stated at the Inquiry* that the area covered by the Manchester Grid Control Centre was deficient in coal for electricity generation; the siting of nuclear power stations in such areas would ensure that the maximum economic benefit was derived from the nuclear power programme; and that the site at Trawsfynydd is (with one exception, which is suitable for a larger station they hope to build in the future) the only site they can find in this area which meets the exacting requirements for a nuclear power station. Among these requirements are relative isolation, availability of adequate water for cooling purposes, and good foundation conditions for the reactors. An additional advantage of the Trawsfynydd site is that being only four and a half miles from the pumped storage station at Tan-y-grisiau a single connection to the grid system can be used jointly by both schemes.

The two Ministers came to the conclusion that the Board are fully justified in their contention that their application was only submitted after a most careful assessment of all the factors involved and thorough examination of other possible sites. They are also satisfied that no other inland site in the region and no site on the coast east of the Menai Straits could satisfy the three essential conditions referred to above. Sites in Anglesey and Cardiganshire would involve very much longer transmission lines.

Site in National Park

It is clear, the letter continues, that special considerations apply to industrial development in National Parks, but it cannot be maintained (and was not suggested at the Inquiry) that no industrial development of any kind should take place in these areas. The question to be decided is whether the proposed development is acceptable, having regard to all the circumstances.

A nuclear power station involves no smoke or smell, and when completed the transport of materials is negligible. The proposed development is therefore not open to objection from these points of view; the objection is rather to the size of the buildings. At Trawsfynydd, however, this objection is reduced by the configuration of the ground round the site, and the station will not appear unduly conspicuous or out of scale with its surroundings. It will not be possible to see it at all from the greater part of the Snowdonia National Park. As regards the area in which it can be seen, it should be possible to construct the station without gravely impairing the natural beauty of the Park, and the Board will employ a landscape consultant for this purpose and will, as in the case of all power stations, consult with the local planning authority and the Royal Fine Art Commission before finally settling the layout and design of the buildings. There is strong local support for the power station as something that will increase and diversify the opportunities for employment and help to arrest the decline of population. It is not to be expected that the establishment of the power station will, by itself, solve these problems, but the contribution it will make is an argument which cannot be disregarded.

The placing of the transmission line from Trawsfynydd to Tan-y-grisiau underground where it crosses the Vale of Ffestiniog (as suggested at the Inquiry) would be extremely costly and the benefit of doing this would be largely offset by the unsightly terminal structures required. The two Ministers consider that the route proposed by the Board is the best that can be found and that by allowing a tolerance of 1,600 yd to westward in siting the towers where the line crosses the Vale of Ffestiniog the Board will be able to site them where they will be least conspicuous.

* The Report of the Public Inquiry is now published by H.M. Stationery Office, price 3s.

Australian News

A GENERAL increase of about 4 per cent in electricity tariffs as from 1st July is announced by the South Australian Electricity Trust. This increase, the first since 1952, is caused by continued increases in costs. A spokesman for the Trust says that there was a general reduction in charges in 1954, and the new tariff will restore rates to about the 1952 level.

Efforts are still being made to have all import restrictions removed. During the month of March, Australia's imports were down in value from the £62·8 million of February, to £59·6 million. "Continuation of the present import controls, despite the recent welcome relaxation, may stifle competition and confer a monopoly on existing importers," complains Mr. R. F. Holder, chairman of the Australian National Committee of the International Chamber of Commerce.

The electrical industry in New South Wales will have to meet additional costs if the State Government implements its plan for equal pay for both men and women. It has recently been computed that Australians work fewer hours a year than any other people in the world except Indonesians. It seems that Australians work beween 1,888 and 1,912 hours a year as compared with the 2,152 to 2,192 hours in Britain and 1,984 hours in the United States.

PARLIAMENTARY REPORT

Cheques Act

Referring to the confusion which still existed about the effects of the Cheques Act, 1957, Mr. J. B. Hynd told the Commons last week during an adjournment debate that he had received from the Eastern Electricity Board recently a notice stating that if an account was not paid his electricity supply might be cut off without further notice. He said that this was due to the fact that this Board did not provide a receipt on the last occasion when he paid his electric light bill. "I had to ask for a receipt," he said, "and if I send my subsequent bill back to them and do not ask for a receipt I will get the bill back unreceipted. I will have no evidence whether or not it has been paid and on returning from holiday I might find a man at the door waiting to cut off the electricity supply, and be faced with a charge for disconnecting and reconnecting the supply. It may be said that all the customer has to do is to write 'Receipt required' when he sends back the bill with his payment, but anybody with any experience knows that hundreds and thousands of firms are taking no notice of that comment. Many of my business friends are having bills sent back with no receipt, although they had asked for one."

Other firms were trying to avoid paying stamp duty by stamping on the bill the single word "Paid" or "Paid by cheque." He thought steps should be taken to make public the fact that the provisions of the Stamp Act, 1891, still applied and had in no way been affected by the Cheques Act. Because the nationalised industries had adopted the practice of not issuing receipts unless one was requested local authorities had to follow suit. This practice caused a tremendous amount of inconvenience and annoyance to the public, and in the case of the final notice sent out by the Electricity Board insolence to the customers was added. Something should be done by the Minister to make it clear that a receipt was still required in these cases if the amount was over £2.

Mr. J. E. S. Simon, Financial Secretary to the Treasury, agreed that nothing in the Cheques Act had disturbed the right of the debtor to demand a stamped receipt, but where this was not requested the cheque was now accepted as evidence that an account had been paid. If a firm disregarded a request for a receipt, it was committing an offence under the Stamp Act.

L.E.B. Investigation

Mr. Charles Hobson asked the Attorney General if he would instruct the Director of Public Prosecutions to institute proceedings as a result of the investigations carried out by Deloitte, Plender and Griffiths on Government instructions into the affairs of the contracting section of the London Electricity Board.

Sir Reginald Manningham-Buller replied in the negative.

Mr. Hobson further asked what information had been given to the Director of Public Prosecutions in accordance with Section 3 of the Prosecution of Offences Act, 1884, by the Southampton Police in regard to their investigations into the affairs of the contracting section of the London Electricity Board.

The Attorney General said that none had been given. The inquiries were not yet complete.

Technical Collaboration with Euratom

Asked by Mr. Roy Mason what progress had been made to secure a technical collaboration agreement with Euratom, Mr. Butler, Lord Privy Seal, said discussions were held in Brussels in July. Good progress was made in the preparation of a draft agreement between the United Kingdom Government and Euratom. This was now being considered further by both sides.

Declassifying Atomic Energy Information

Mr. Roy Mason asked the Prime Minister to what extent it was the intention of the United Kingdom and United States Governments, under the recent atomic energy agreement, to continue with the present method of declassifying atomic energy information with the same committee, including Canadian representation.

Mr. Macmillan said he hoped that when the new agreement was in force, declassification arrangements would continue to follow the existing well-established procedures.

Dounreay Reactor

Mr. Mason asked when the Dounreay breeder reactor project would be completed; and whether, in view of the recent agreement between the United Kingdom and the United States of America for co-operation on the uses of atomic energy for mutual defence purposes, it was still the intention to go ahead with the development of a submarine nuclear propulsion plant.

Mr. Macmillan said that construction of the Dounreay breeder reactor was expected to be complete towards the end of this year. This would be followed by a period of component and circuit testing, and a chain reaction was expected to start in the reactor in the late spring of 1959. Development of nuclear submarine machinery in the United Kingdom, including the construction of a land-based prototype at Dounreay, would continue. Information obtained under the agreement for co-operation in the use of atomic energy for mutual defence purposes would enable us to make full use of American experience, so that our own development would proceed more certainly and without unnecessary duplication of effort already expended in the United States.

Heavy Indivisible Loads

The exclusion of heavy and indivisible loads from the new motorways —which brought a public protest from the British Electrical and Allied Manufacturers' Association—was sharply criticised by members of the Commons when two Orders embodying regulations for the first of the motorways, the Preston by-pass, were considered.

Mr. Nugent, Parliamentary Secretary, Ministry of Transport, explained that the regulations would be used on this stretch of road as an experiment before the opening of the London-Birmingham motorway in the autumn of 1959. The Government had decided that, to start with, the regulations should exclude vehicles which by their nature were unlikely to be able to conform to the average speed of the traffic. There would be no speed limit. Although abnormal indivisible loads were prohibited the Minister would permit these loads to proceed experimentally on the motorway and the Ministry would learn by experience whether they did, in fact, cause serious impediment and danger to traffic (as they feared they might) or whether the traffic sorted itself.

Mr. Frank McLeavy said the Transport and General Workers' Union considered it was unreasonable to exclude vehicles carrying abnormal and indivisible loads. The large sums being spent on the motorways should be directed to assisting not only the private motorist but the industrial life of the nation. The aim should be to help industrialists shift their goods from point to point at a cheaper rate per mile than was possible on the congested roads to-day. It was far better that these big loads should go on the motorways than through the winding streets and lanes of Britain, going miles out of course to avoid low bridges and requiring police to escort them.

Mr. Geoffrey Wilson said that in the long run industry would benefit by having the heavy, indivisible loads kept off the motorways. It was to the general benefit of industry to have a speeding up of passenger and goods traffic on the roads.

Mr. Thomas Oswald pointed out that the Minister was not debarring the transportation of military vehicles. Huge tanks and guns could be transported as indivisible loads. In those circumstances he must protest against the restriction placed on heavy abnormal loads belonging to industry. With no traffic coming towards him,

the driver of a faster vehicle would easily be able to take precautions when passing such loads.

Mr. R. Gresham Cooke was referring to indivisible loads when the Minister of Transport, Mr. Watkinson, interrupted to say, "There is no intention of banning abnormal, indivisible loads at all for the purpose of experiment on this motorway. When we want to control the kind of load, it is necessary to make a prohibition order. There is no long-term ban."

Mr. Gresham Cooke commented that in 20 years of campaigning for motorways, his main argument had been that they would take this heavy traffic away from the little towns and villages and the narrow roads. It was suggested that these loads should go by sea or train. That could not happen because they generally originated from places like Rugby, far from the sea, and they could not go by train because they were too big for the tunnels. The logical place for them was on the motorways. It was quite practicable too, for each lane was 12ft wide, and in addition there was a one-foot strip of contrasting coloured material at the side.

Vice-Admiral Hughes Hallett called the indivisible loads "juggernauts" and said the House should not show too much sympathy with those who shifted such enormous loads. If the Government were firm, he was certain it would be found possible to divide up these so-called indivisible loads.

Mr. R. E. Prentice protested about the lack of proper consultations with trade unions and industry. The British Electrical and Allied Manufacturers' Association had expressed regret that the Minister before issuing draft regulations which affected the movement of heavy indivisible loads did not advise the heavy electrical and allied plant industry which was directly affected by the proposals. The result of the Government's action was that the Minister was deprived of advice from the people who were best able to give it, people with practical day-to-day experience of conditions on the road. What must be remembered was that the costs of moving these loads affected prices, and sometimes the prices of exports.

Mr. Rees-Davies, who is president of the National Conference of Road Haulage Operators, said that the conference had informed the Minister that the indivisible loads formed an important part of the national and export trade and should be moved as quickly and efficiently as possible to destination. They had said that such loads on narrow highways were a greater public danger than they would be on the motorways. He suggested that these loads could be permitted to travel at night on the motorways.

After listening to the debate, the Minister, Mr. Watkinson, said he wanted to try as many combinations as possible of traffic on the Preston road in the hope that when he came to the House with more permanent regulations for the motorways in nine months' time they would be based on really wide knowledge and practical experience. The difficulty with the abnormal load was that it closed more than one lane—over half of the road—and traffic in one direction would be completely bottled up behind it. However, he had not a closed mind on this. "We must experiment and see how we get on," he said.

The Orders were approved.

This matter was also discussed at some length in the House of Lords.

European Free Trade

In a statement on the European Free Trade Area negotiations, Mr. Maudling, Paymaster General, said that following the hold-up in the talks since March, there was a meeting of representatives of European Governments at the end of July in Paris where it was decided to proceed with negotiations and to co-operate in establishing the free trade area. Detailed directives were issued for the further study of the problems arising from differing external tariffs, and from the special conditions in the less developed countries. Another meeting was to be held in October when it was hoped that substantial progress would be made. The main problems had by no means been overcome, and it was now clear that they could not get a treaty signed and ratified by the time that the Common Market (between Germany, France, Belgium, Italy, Holland and Luxembourg) came into existence on 1st January, 1959.

Patent Office Science Centre

Lord Hailsham, Lord President of the Council, announced that a site was being obtained on South Bank, London, for the Science Centre of the Patent Office, and building would start within five years. It would be designed to accommodate, in addition to the Patent Office, a new National Reference Library of Science and Invention, built up from the existing Patent Office Library. The Government believed this would make an important contribution to the spread of scientific and technical knowledge.

It was originally intended that the scientific learned societies at present housed in Burlington House and elsewhere, together with other scientific bodies, should be provided with accommodation on a site adjoining the Science Centre, but a review had shown that the needs of the Royal Society and other societies could be met more satisfactorily for some time to come in Burlington House and neighbourhood.

Criticism and "Privilege"

Giving members some advice about writing letters to Ministers and passing on complaints received from the public, Mr. R. A. Butler, Leader of the House, said that the recent vote of the House on the case involving a letter written by Mr. G. R. Strauss, M.P., to the Paymaster General about the London Electricity Board, was a decision that that particular letter was not a "proceeding in Parliament." Although it applied to a particular case, it reminded members that they should exercise the greatest care in writing to Ministers and to the chairmen of the national boards and he hoped no members would see fit to forward for investigation allegations which they believed to be mischievous or frivolous.

It was in the interests of everyone that the public and M.P.s should feel free to make a proper complaint about the administration of the public services but many criticisms could not be satisfactorily investigated without passing on the letter or its contents to the bodies immediately responsible. Hon. members should understand clearly therefore that in the absence of an expressed request to the contrary, Ministers might pass on the contents of their letters and if necessary the letters themselves to bodies outside the Government service. He advised members to use discretion. If a member forwarded a letter in good faith he would be covered by qualified privilege in the courts.

Safety of Dounreay

Lord Thurso asked the Government whether the fears of an explosion in the atomic plant at Dounreay had been eliminated by the major changes in design which were explained to Parliament in May, 1957.

Lord Mills, Minister of Power, said his statement in 1957 concerned, *inter alia*, the possibility of the melting of the fuel elements. Experiments had confirmed that the catch-pot which would collect and disperse molten fuel would do so in a safe way without producing a critical accumulation. Some minor alterations in design had been introduced. The Atomic Energy Authority had assured the Prime Minister that the reactor at Dounreay would not be operated under any condition which could foreseeably lead to a failure of the outer sphere.

Industrial Development

Mr. William Shepherd asked the President of the Board of Trade whether, in view of the industrial congestion in certain parts of the country, and of the need for new industry in others, he would take steps to deal with the situation.

Sir David Eccles said it was not the practice of his Department to issue Industrial Development Certificates—save in the most exceptional circumstances—for firms wishing to set up new factories in the more congested parts of the country. The certificates issued in those places were almost entirely for extensions or efficiency projects which it would be uneconomic to separate from the existing buildings. He proposed in future to examine all such applications, both for new buildings and for extensions, even more

critically than in the past and to extend the practice at present applied in the Greater London and Greater Birmingham areas to other parts of the country where unemployment was low. He recognised that this might mean refusal to allow a project to go forward in some particular place even though the labour could be found. But there were other places where the need for new industry was much greater and it was these in particular that he hoped would benefit from this decision.

He realised that the location of a new development in one of these places might result in a firm having to bear increased costs both in building the new factory and in connection with the movement of its plant or its key workers, or in the marketing of its products. It was to help to meet such problems that loans and grants would be made under the Distribution of Industry (Industrial Finance) Act. Enterprises already situated in these places might also be eligible for assistance under this Act.

The Board of Trade later explained that the grants and loans would be adapted to suit the particular needs of the applicant in meeting uneconomic costs that he might incur by going to one of these places, for example, the moving of machinery and plant, building houses for workers, the levelling of sites, and the provision of railway sidings. Additional transport costs would also be taken into account.

Nuclear Power Station Modification

In a written reply to a question on the modification of the third and subsequent nuclear power stations for the provision of plutonium for military purposes, Mr. Maudling, Paymaster General, said that the decision had been taken solely as a precaution for defence purposes. Whether they would ever be used in that way would depend on defence requirements. The decision in no way reflected any change in the assessment of the economics of the British nuclear power stations, and there was no reason why the sale of nuclear equipment abroad should be affected in any way.

Goods to China

Mr. John Rankin asked the President of the Board of Trade whether he would remove high-speed cinematograph cameras and electronic computers from the list of goods subject to embargo for trade with China and the Soviet bloc.

Sir David Eccles said the member would have to wait until the changes in the embargo list were published on 15th August.

Technological Awards

Mr. Arthur Lewis asked the Minister of Education if he would state what official facilities existed to enable the holders of the Diploma of Technology or similar qualifications to obtain higher qualifications by research or other means.

Sir Edward Boyle, Parliamentary Secretary, said that last year the National Council for Technological Awards set up a committee to recommend what post-graduate awards the Council should offer. He understood that they hoped to receive the committee's recommendations in the autumn.

East-West Trade

Answering questions about the strategic controls on trade with Communist countries, Mr. Ian Harvey, Under-Secretary, Foreign Office, said that agreement had been reached on a substantial relaxation of the Embargo List.

The list was not yet available in final form, as certain technical details concerning a number of items were still being worked out in the Co-ordinating Committee (COCOM). It was, however, already clear that the Government's objective of confining the list to items of real strategic significance had been, in great measure, achieved.

The work on technical details which was still going on would be completed very shortly and the new Embargo List would be published on 15th August and would be effective from that date.

CATALOGUES AND LISTS

INSULATION MATERIALS.—38-page booklet describing the company's range of products which includes insulating yarns and cloths based on fibrous acetylated cellulose.—**Cotopa, Ltd.,** 55, Tyrrel Street, Bradford, 1.

THERMOSTAT.—Leaflet (3022) dealing with the type TQB/A adjustable water heater thermostat.—**Sunvic Controls, Ltd.,** P.O. Box 1, Harlow, Essex.

VALVES.—Booklet and series of brochures giving technical data and particulars of the company's range of valves, including rectifiers, voltage stabilisers, klystrons, magnetrons and valves for radio frequency heating, etc.—**English Electric Valve Co., Ltd.,** Waterhouse Lane, Chelmsford, Essex.

VARIABLE SPEED GEARS.—Brochure G.P./8 giving particulars and illustrations of hydraulic variable speed gears capable of giving a 27/1 stepless speed range and suitable for use in conjunction with British Standard motors and specially designed reduction units.—**Carter Gears, Ltd.,** Thornbury Road, Bradford, 3.

RECTIFIERS.—48-page booklet dealing with Series 400 selenium rectifiers.—**Standard Telephones & Cables, Ltd.,** Edinburgh Way, Harlow, Essex.

TERMINAL BLOCKS. — Illustrated brochure (NBQ/10) dealing with a range of insulated connectors and terminal blocks.—**Metway Electrical Industries, Ltd.,** Metway Works, Kemp Town, Brighton, 7.

EARTHING SYSTEM.—Illustrated catalogue and separate price list covering the "Portaway" earth continuity and bonding system.—**Porter Electrical Products, Ltd.,** 2, North Park Road, Harrogate, Yorks.

INSULATORS.—Leaflet dealing with the company's range of "Ethox" epoxide resin heavy duty post type insulators.—**J. R. Ferguson (Electrical Engineers), Ltd.,** Tameside Works, Park Road, Dukinfield, Cheshire.

CABLES.—Leaflet (158) dealing with "Cordaplas" p.v.c. multicore cables and flexibles.—**Concordia Electric Wire & Cable Co., Ltd.,** Long Eaton, Nottingham.

WELDING EQUIPMENT.—Leaflet describing a new portable 150 A d.c. welding unit designed for use with the "Land Rover" vehicle.—**Lincoln Electric Co., Ltd.,** Welwyn Garden City, Herts.

WIRING ACCESSORIES.—84-page illustrated and priced catalogue (1194) giving particulars of the company's range of wiring accessories including miniature circuit-breakers and earth leakage circuit-breakers.—**J. A. Crabtree & Co., Ltd.,** Lincoln Works, Walsall.

TRANSFORMERS.—Leaflet announcing the introduction of a range of heavy duty portable transformers fitted with plugs and sockets.—**Sturdy Electric Co., Ltd.,** Sturdy Works, Hamsterley Colliery, Newcastle-upon-Tyne.

WELDING EQUIPMENT. — Illustrated 10-page catalogue of the company's electronic controls for resistance welding machines.—**Sciaky Electric Welding Machines, Ltd.,** Falmouth Road, Trading Estate, Slough, Bucks.

RECTIFIERS.—Booklet dealing with mercury vapour and xenon rectifiers for high voltage power supplies.—**Mullard, Ltd.,** Mullard House, Torrington Place, London, W.C.1.

ELEMENTS.—Illustrated broadsheet dealing with "Crusilite" non-metallic electric furnace elements.—**Morgan Crucible Co., Ltd.,** Battersea Church Road, London, S.W.11.

CONDUIT FITTINGS.—Leaflet describing a new 13 A socket-outlet or switch box for use in dry partition walls.—**Fitter & Poulton, Ltd.,** Vincent Parade, Birmingham, 12.

DOMESTIC APPLIANCES.—Folder illustrated in colour giving particulars of the company's range of electric irons, kettles and coffee percolators.—**Lincass Electric, Ltd.,** White Hart Yard, Guildford Street, Chertsey, Surrey.

Illustrated folder covering the "Metway" range of domestic appliances.—**Metway Electrical Industries, Ltd.,** Canning Street, Kemp Town, Brighton, 7.

GENERATING EQUIPMENT.—12-page booklet (A2010) dealing with alternators and d.c. generators produced by the company.—**Crompton Parkinson, Ltd.,** Crompton House, Aldwych, London, W.C.2.

LAMPS.—12-page booklet (7484-2) describing a new xenon lamp for cinema projection purposes.—**B.T.H. Sound Equipment, Ltd.,** Reynolds House, Great Newport Street, London, W.C.2.

LIGHTING FITTINGS. — Catalogue dealing with the company's range of "Ionic" glass decorative pendant and wall fittings.—**Harris & Sheldon (Electrical), Ltd.,** Ryder Street, Birmingham, 4.

30-page catalogue giving illustrations, prices and particulars of the company's range of decorative lighting fittings.—**Knightshades, Ltd.,** Silverhill Works, Theaklen Drive, St. Leonards-on-Sea, Sussex.

MEASURING INSTRUMENTS.—Leaflet describing a 300 Mc/s vacuum-tube voltmeter having five a.c. and five d.c. ranges and two ohm ranges.—**Marconi Instruments, Ltd.,** St. Albans, Herts.

34-page illustrated list (163/1) giving abridged specifications of the company's range of electrical instruments, and leaflets (149/1 and 144/B/1) dealing with a recording accelerometer and gas analysers.—**Cambridge Instrument Co., Ltd.,** 13, Grosvenor Place, London, S.W.1.

Eight descriptive leaflets illustrating various instruments in the company's range.—**Everett Edgcumbe & Co., Ltd.,** Colindale Works, Hendon, London, N.W.9.

Illustrated catalogue (IN.1) dealing with the company's range of 2, 2½ and 3½in dial panel mounting instruments, including electrostatic and hermetically sealed types.—**Ferranti, Ltd.,** Hollinwood, Lancs.

NEW ELECTRICAL EQUIPMENT

Luminous Ceiling

A new luminous ceiling which provides efficient, shadow-free illumination and has been designed for speedy installation in both new and existing buildings, is now being produced by SCAFFOLDING (GREAT BRITAIN), LTD., Willow Lane, Mitcham, Surrey. Known as the SGB "Glolite" ceiling, it is particularly suitable for installation in offices, shops, schools, factories, etc. The channel sections of 5 by 1½in by 16 gauge mild steel are held by rods hung from the structural ceiling. They support infilling panels which may be in continuous lengths or divided at suitable intervals by noggin pieces of the same section.

The luminous ceiling itself is available in two forms. In "Glolite 1" the channel sections are spaced at 35½in centres and "Fibreglass" sheets of dogtooth profile are supported on studs fixed to the sides of the channel. In "Glolite 2," ½in by ½in mild-steel channel is fixed to the side of the main channel (spaced at 36in centres) to hold a corrugated p.v.c. infill. The channel sections are normally supplied with a priming coat of neutral colour, but may be stove-enamelled, at extra cost, if required.

Air-Pressurised Conduit

The Factory Inspectorate has recently issued a general approval of the air-pressurised electrical system made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. This certificate covers the use of the system where there may be risk from any of the vapours or gases in the pentane, ethylene and hydrogen classes. Any mains-operated electrical equipment or conduit which is suitable for pressurisation at ¼ p.s.i. or more can be operated in hazardous areas by means of the pressurised system. This includes motors, as totally-enclosed machines can be adapted by using suitable gaskets.

The essential element in the pressurised system is the intrinsically safe control circuit, which opens the mains contactor if there is a loss of pressure in the conduit or in any of the apparatus connected to it. This is a low voltage circuit fed from an intrinsically safe transformer and is carried inside the same conduit as contains the mains cables. The circuit energises a relay in the operating coil circuit of the mains contactor, and is completed through the contacts of pressure switches included in the conduit run at intervals of 15 to 20ft. Thus, the opening of the contacts of any pressure switch due to a loss of pressure in the system results in the tripping of the mains contactor, and it is also impossible to energise the operating coil of the contactor to switch on the mains supply unless the system is correctly pressurised. On the other hand, the control circuit, being intrinsically safe, can remain energised irrespective of whether pressure is present or not throughout the installation.

The equipment supplied by the G.E.C. includes complete air control panels, but the air supply itself is taken from the works compressed air lines through a reducing valve or, for lower pressures (below about ½ p.s.i.) from a blower.

Variable Speed Drives

The range of variable speed drives made by LANCASHIRE DYNAMO NEVELIN, LTD., Rectifier Division, Hurst Green, Oxted, Surrey, has been extended by a standard equipment which has been developed to give a high accuracy wide speed range drive. The "Nevimag" drive consists of a transductor-controlled Ward-Leonard set. It is particularly applicable for drives requiring regenerative braking or where heavy peak loads occur. For outputs below 10 h.p. it is frequently a more economic drive than the Lancashire Nevelin "Varionic."

The equipment consists of a motor-generator set, the control unit cubicle housing the magnetic amplifier and the control gear, the operator's control station and the variable speed d.c. motor. The motor-generator set and the control unit cubicle may be sited at any convenient out-of-the-way situation, and the operator's control station may be placed at any point suitable for the operator. The control unit cubicle is wired ready to receive the a.c. supply, and incorporates an isolating switch. The operator's control station contains the necessary start and stop push-buttons, together with a small potentiometer to give complete speed control over the whole range.

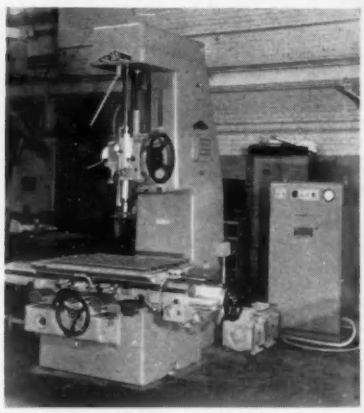
Control is achieved by means of a magnetic amplifier providing the power source feeding the field of the Ward-Leonard generator. By a closed loop system a comparison is made between a speed reference source derived from the speed control potentiometer and the armature voltage which is related to the speed of the motor. In addition, suitable circuits are included to compensate for the IR drop. Any error is amplified by means of the transductor which regulates the supply to the generator field. In this way the generator output is monitored and hence the necessary voltage is supplied to the motor to obtain a level speed characteristic.

"Nevimag" drives are available having a speed range of 40/1 with a regulation of ±2 per cent light load to full load. Adjustable current limitation is fitted as a standard feature. Dynamic braking, reversing or automatic control of speed can be provided when required.

Heat Pump

The latest addition to a range of heat pumps produced by HEAT PUMPS & REFRIGERATION, LTD., Lansdowne Lane, Charlton Village, London, S.E.7, is the "Econom," a combined space cooler and water heater. The unit has been specially designed for beer cellars, industrial kitchens, dairies, etc., and can also be used in place of an

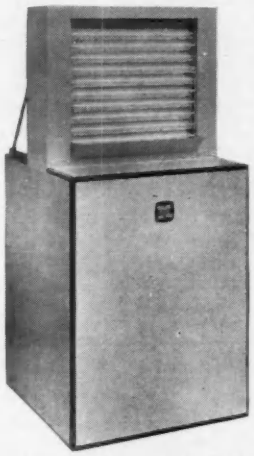
Left: A typical installation of the G.E.C. air-pressurised system incorporating three control units of the type designed for use in a "safe" area near to the hydrogen area



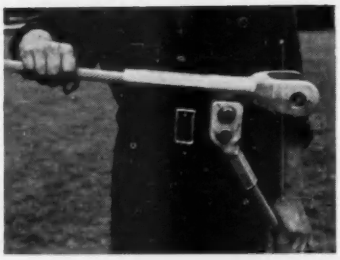
Right: Lancashire Dynamo Nevelin 4 h.p. "Nevimag" variable-speed drive installed on a Newall high precision jig borer

existing water cooled condensing unit. The cooling capacity ranges from 4,500 to 9,500 B.Th.U/hr and the hot water output is 150/280 gal/day.

The heat pump fits into a very small area, occupying not more than 4 sq ft, and can be used singly or in multiples. The refrigerant circuit includes a "Tecumseh" sealed motor compressor and its capacity-start induction type motor (from ½ to 1 h.p.) is fitted with overload protection. The casing of the cabinet is lined with acoustic and thermal insulation and the whole is "Bonderized" and finished in hammer tone enamel. An estimate of the heat ingress and other heat loads must be made for each room before the right size of "Econom" can be selected, and in this the company's technical department will be pleased to assist purchasers.

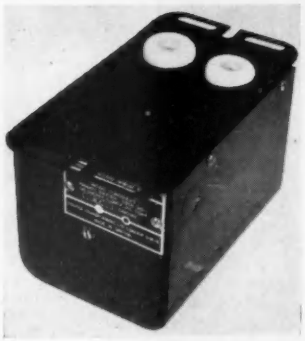


Heat Pumps & Refrigeration's "Econom" heat pump



Compressed dead-end fitting from the "Noralgrip" range

Foster ignition transformer



Aluminium Conductor Accessories

A range of full-compression conductor accessories that are cheaper, lighter, and more quickly compressed than earlier types is announced by the NORTHERN ALUMINIUM CO., LTD., Banbury, Oxfordshire. Known as the "Noralgrip" range, these new compression fittings supersede the former "Tubular" accessories and have been approved by the C.E.G.B.

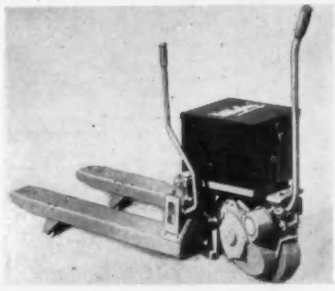
They are designed for use on e.h.v. overhead aluminium transmission lines and earth-wire conductors, and include dead ends (both single- and double-jumper terminal types), midspan joints, and disconnectable non-tension joints. "Noralgrip" fittings can be applied more quickly with standard compressors and compression time can be very much reduced by the use of the new "Noral" motorised hydraulic compressor.

As with earlier designs of "Noral" fittings, these joints are compressed hexagonally, since this type of forming ensures a fully homogeneous joint. Further time saving is afforded, and a reliable connection ensured, by avoiding the need for contact preparation in the field, dead-end lugs and jumper terminal contact surfaces being pre-treated before leaving the factory, the surfaces being protected by a strippable plastic film. Steel compression components are pre-filled with "Unigrip C" jointing compound, the ends of the joints being capped with strippable plastic.

Battery Pallet Truck

A compact and easily handled pedestrian electric battery pallet truck, for loads up to 10 cwt, is announced by WESSEX INDUSTRIES (POOLE), LTD., West Street, Poole, Dorset.

Wessex Industries "Wrigley" E412P 10 cwt battery pallet truck



The power unit is completely enclosed in a small fabricated housing carrying the motor with automatic brake on the armature, reduction gearing, controller, ball bearing wheel hub and taper roller bearing steering head, driving a detachable solid rubber tyred wheel.

This new model, the "Wrigley" E412P, can be obtained with a manual or power operated hydraulic pump or ram and the pallet forks are available in alternative lengths and widths. The battery is an "Exide" traction type, 12 V 87 Ah, which is housed in a quickly detachable steel case, with charging socket. A Westinghouse type VZ6/10 charger is used.

Ignition Transformers

A range of continuously rated ignition transformers for oil burners has been announced by FOSTER TRANSFORMERS, LTD., South Wimbledon, London, S.W.19. The output of 10 kV, mid-point or one end earthed, is suitable for most modern burners.

Customers have a choice of two cases, Type A being the larger version, having a liberal primary terminal chamber with removable plate for easy wiring. There are three alternative conduit knock-outs available, one in the end of the case and one each side. Type B has a small primary terminal chamber to reduce the overall length and there is only one cable entry. The high voltage terminals can be mounted in the base plate or in the end of the case.

Unit Heater for Blowers

A new heater unit, the "Simoom," for use in conjunction with any of the standard range of the company's portable blowers, has been introduced by the Electrical Equipment Division of the MARTINDALE ELECTRIC CO., LTD., Westmorland Road, London, N.W.9. It is available in three sizes, 1, 2 or 3 kW, in the 100/130 and 200/250 V ranges, and the average heat generated is claimed to be from 80 to 226 deg C above that of the surrounding atmosphere. Greater heats can be obtained by running the blowers more slowly or otherwise slightly reducing the volume of air delivered. The construction of the heater is such that a high proportion of the heat generated is induced into the air discharged. This is effected by mounting the heating elements on ceramic spiders, over which the air has to pass, and by providing the heater with a double skin which keeps the heat inside and ensures a cool, comfortable exterior.

The heater is fitted with an on/off switch and independent lead, so that when fitted to a blower the complete unit acts as a hot or cold air blower, or the heater can be quickly detached when not required.

In use, the blower must be switched on before the heater, but as a safety precaution all models are fitted with a thermal cut-out to prevent overheating and burning out.

DOMESTIC ELECTRICAL EQUIPMENT

BLANKETS AND PADS

MORE electric blankets are now being sold in this country than at any other time and it is estimated that the annual sales figure is fast approaching the million mark. There are over 200 different models from which to make a choice, ranging in price from £3 to over £20, and in the following survey we give particulars of the products of more than forty different makers. About half of the manufacturers have received the approval of the British Standards Institution entitling them to use the "Kite Mark" on their products, or have submitted blankets for approval and are awaiting certification.

Electric blankets are of two kinds, those with a high loading, which heat up quickly and are provided with thermostatic control, and those with a lower wattage rating which employ a self-compensating type of element. With the latter type the blanket does not exceed a temperature above 140/150 deg F, irrespective of how long it is left switched on. Apart from these models, which operate direct from mains voltages, there are also several blankets which operate at 12 or 24 V, through a transformer.

Providing the simple operating instructions are observed the electric blanket is completely safe in use, the heating elements being so installed that they cannot come into contact with the user. The elements of approved types may be sheathed in asbestos, plastic (p.v.c.) or fibreglass, all of which pass the B.S.I. safety tests. Only p.v.c. is, however, considered to be completely waterproof.

Electric blankets should not be washed, nor should they be dry-cleaned, but providing they are regularly serviced by the manufacturers (say, every two years) they should have a life of from ten to twelve years.

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
AJAC ELECTRICAL PRODUCTS, LTD., Morley Road, Llandudno.	"Ajac"	48×33 and 54×30	75 W	Non-thermostatic	Pink	Raised cotton	Element to BSS. 2612	£3 1 8	£0 13 6
E. F. ALLCHIN & CO., LTD., 253, Bordesley Green, Birmingham, 9.	"Beurer"	30×50 (a) 40×62 (b) 60×50 (c)	50 W (a) 110 W (b) 100 W (c)	Variable heat switch	Floral	Cotton	Washable cover	£5 17 4 (a) £8 3 10 (b) £9 17 7 (c)	£1 6 5 (a) £1 16 11 (b) £2 4 5 (c)
	"Beurer"	30×50	50 W	Single-heat	Floral	Cotton	12 V model available	£4 8 6 £6 0 8 (12 V)	£0 19 11 £1 7 2 (12 V)
	"Beurer"	12×16	50 W	Three-heat (a) three-heat waterproof (b), variable heat (c)	Floral	Cotton	Washable cover	£1 19 0 (a) £2 5 4 (b) £2 6 5 (c)	£0 8 9 (a) £0 10 2 (b) £0 10 5 (c)
H. J. BALDWIN & CO., LTD., 132, Arkwright Street, Nottingham.	"Thermat" WBS	54×27	60 W	Single-heat	Pink or blue	All wool, cotton cover	Made to BSS. 2612	£3 18 0	£0 17 0
	"Thermat" WBD	54×42	100 W	Single-heat	Pink or blue	All wool, cotton cover	Made to BSS. 2612	£5 14 6	£1 5 0
	"Thermat" FM De-luxe	60×26	75 W	Single-heat	Pink or blue	Proofed duck cloth, wool mixture cover	Made to BSS. 2612	£5 18 0	£1 5 7
	"Thermat" LF De-luxe	60×48	135 W	Single-heat	Pink or blue	Proofed duck cloth, wool mixture cover	Made to BSS. 2612	£10 0 0	£2 3 4
BEST PRODUCTS, LTD., Felix Works, Felixstowe, Suffolk.	"Best" Blanket	60×30	90 W	Self-compensating element	Apricot	Duplex rayon	One-piece element, d.p. switch	£4 15 6	£1 1 0
	"Best" mattress overlay	60×30	100 W	Self-compensating element	Maroon figured	Cotton damask	One-piece element, d.p. switch	£4 6 1	£0 18 11
BESTFRIEND ELECTRICAL CO., LTD., Diceland Works, Banstead, Surrey.	"Luxecon" single	60×30	78 W	D/P neon illuminated switch	Various pastel shades	Raised cotton	Fireproof	£3 15 0	£0 16 5
	"Luxecon" double	60×50	130 W	D/P neon illuminated switch	Various pastel shades	Raised cotton	Fireproof	£5 19 6	£1 6 2
BLANELLA, LTD., Thorp Arch Mill, Boston Spa, Yorks.	"Cozee Cumfort" single	24×50	58 W	Single-heat	Pastel pink and blue	Flameproofed cotton	Three-year guarantee	£2 13 3	£0 11 8
	"Cozee Cumfort" double	44×54	114 W	Single-heat	Pastel pink and blue	Flameproofed cotton	Three-year guarantee	£4 0 0	£0 17 6

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
BULPITT & SONS, LTD., St. George's Works, 132, Icknield Street, Birmingham, 18.	712A	60×30	90 W	Thermal balance	Pink, peach or pastel blue	Raised cotton	Made to BSS. 2612	£4 3 8	£0 18 4
	714A	60×50	135 W	Thermal balance	Pink, peach or pastel blue	Raised cotton	Made to BSS. 2612	£6 3 0	£1 7 0
CHALFONT ELECTRICAL PRODUCTS, LTD., Tyrrell Street, Leicester.	"Junior" single (a), double (b)	48×26 (a) 48×39 (b)	60 W (a), 90 W (b)	Single-heat switch	Pink, peach and green	Fleecy mixture	Satin ribbon binding	£2 15 6 (a) £3 12 0 (b)	£0 12 0 (a) £0 15 7 (b)
	"Warmster" single (a), double (b)	60×24 (a), 60×42 (b)	70 W (a), 130 W (b)	Single-heat switch	Pink, peach and green	Fleecy mixture	Waterproof, satin ribbon binding	£4 0 0 (a) £6 0 0 (b)	£0 17 4 (a) £1 6 0 (b)
	"De-Luxe" single (a), double (b)	60×33 (a), 60×51 (b)	140 W (a), 220 W (b)	Thermostatic, three-heat switches	Pink, peach, blue and green	Wool	Satin ribbon binding, waterproof, dual control (b)	£8 15 0 (a) £14 8 8 (b)	£1 18 5 (a) £3 3 4 (b)
	"Bed Sheet" single	60×33	85 W (a) and 140 W (b)	Thermostatic, single-heat (a) and three-heat switch (b)	Pink, blue and white	Rayon	Waterproof	£6 17 6 (a) £7 10 0 (b)	£1 10 2 (a) £1 12 11 (b)
	"Bed Sheet" double	60×51	220 W	Thermostatic, three-heat switch	Pink, blue and white	Rayon	Dual control, waterproof	£12 16 0	£2 16 2
E. K. COLE, LTD., 5, Vigo Street, London, W.1.	"Juno"	50×30	50 W	Normal heat dissipation	Pink or blue	Fleecy cotton, flameproofed	D/P switch, covers available	£2 15 0	£0 11 11
	"Stella"	60×33	72 W	Normal heat dissipation	Pink or blue	Fleecy cotton, flameproofed	Neon D/P switch, covers available	£3 15 0	£0 16 3
	"Diana"	60×51	116 W	Natural heat dissipation	Pink or blue	Fleecy cotton, flameproofed	Neon D/P switch, covers available	£5 7 6	£1 3 4
	"Sherborne"	60×31	72 W	Natural heat dissipation	Pink, blue and green	Wool mixture, flameproofed	Neon D/P switch, covers available	£5 7 6	£1 3 4
	"Dorchester"	60×51	132 W	Natural heat dissipation	Pink, blue and green	Wool mixture, flameproofed	Neon D/P switch, covers available	£7 12 6	£1 13 1
	"Vigilux" single (a), double (b) and twin (c)	65×36 (a), 72×58 (b & c)	78 W (a), 138 W (b), 2×69 W (c)	Variable thermostat control circuit	Pink, blue and green	Wool mixture, flameproofed	Illuminated temperature control box, D/P switch, covers available	£9 8 9 (a) £14 1 1 (b) £16 1 3 (c)	£2 0 11 (a) £3 0 11 (b) £3 9 7 (c)
DENHAMS (NORWICH), LTD., All Saints Road, Acton, W.3.	"Norvic" pad P.1 and P.3	12×16	45 W (a) and 70 W (b)	Thermostatic, single-heat (a) and three-heat (b)	Pink, blue and peach	Felt base, flannelette (fireproof)	Rayon covers	£2 17 0 (a) £3 10 11 (b)	£0 12 6 (a) £0 15 6 (b)
	"Norvic" single S.3	30×54	100 W	Thermostatic, three-heat	Pink, blue and peach	Felt base, flannelette (fireproof)	Rayon cover	£7 2 0	£1 11 3
	"Norvic" double D.R.3	45×60	150 W	Thermostatic, three-heat switch	Pink, blue and peach	Cotton base, flannelette (fireproof)	Rayon cover	£10 12 9	£2 6 9

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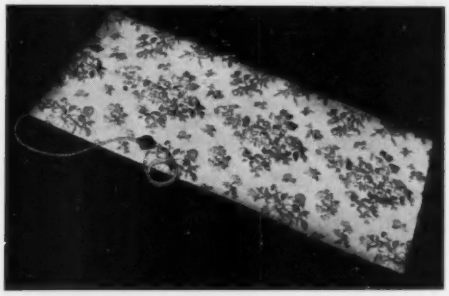

1. *Bulpitt "Swan Brand" blanket*
2. *H. J. Baldwin & Co.'s "Thermat" blanket*

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
DENHAMS (NORWICH), LTD., All Saints Road, Acton, W.3. *(continued)*	"Norvic" double dual-control D.N.3	56×72	200 W	Thermostatic, two three-heat switches	Pink, peach and blue	Wool	—	£15 10 0	£3 8 0
	"Norvic" single T.3	30×54	95 W	Thermostatic, three-heat	Pink, blue and peach	Cotton base, wool (fireproof)	Made to BSS. 2612	£7 10 6	£1 13 0
	"Norvic" 12 V all-night L.3	30×60	90 W	Three-heat through transformer	Pink, blue and peach	Cotton base (fireproof)	Price includes transformer	£9 12 6	£0 17 6
	"Norvic" 12 V all-night D.L.3	50×60	140 W	Three-heat through transformer	Pink, blue and peach	Cotton base (fireproof)	Price includes transformer	£15 7 0	£1 9 0
	"Norvic" single W.1	30×54	75 W	Single-heat	Pink, blue and peach	Wool	Made to BSS. 2612	£5 4 0	£1 2 0
	"Norvic" double D.W.1	45×60	120 W	Single-heat	Pink, blue and peach	Wool	Made to BSS. 2612	£8 16 6	£1 18 6
	"Corona" single C.3	30×50	70 W	Three-heat	Pink or blue	Cotton base (fireproof)	Flannelette cover. Made to BSS. 2612	£4 0 0	£0 17 6
	"Corona" double C.D.3	45×58	115 W	Three-heat	Pink or blue	Cotton base (fireproof)	Flannelette cover. Made to BSS. 2612	£6 10 10	£1 8 8
EASIPOWER, LTD., 27, Albemarle Street, London, W.1.	"Easipower" de-luxe single	60×30	90 W	Non-thermostatic	Peach	Woollen mixture	—	£3 19 4	£0 17 5
	"Easipower" de-luxe double	60×48	130 W	Non-thermostatic	Peach	Woollen mixture	—	£5 19 0	£1 6 0
ELECTRIC BED-WARMERS, LTD., Quality Works, Waterside, Todmorden, Lancs.	"Bedtime Bliss" single	30×54	120 W	Three-heat switch	Pink, blue, gold or green	Duplex cloth whipped with wool	"Calomatique z" long-life element	£6 19 5	£1 8 7
	"Bedtime Bliss" double	50×60	200 W	Two three-heat switches, dual control	Pink, blue, gold or green	Duplex cloth whipped with wool	"Calomatique z" long-life element, dual-control	£13 18 10	£2 17 2
	"Calora" pad De-luxe major	13×8	80 W	Three-heat switch	White	Duplex cloth	Guaranteed two years	£3 2 3	£0 12 9
	"Calora" single	54×27	90 W	On/off switch	Pink or green	Raised fabric	"Calomatique z" long-life element	£3 3 7	£0 13 11
	"Calora" double	60×42	160 W	On/off switch	Pink or blue	Raised fabric	"Calomatique z" long-life element	£6 0 0	£1 5 0
S. I. ENGEL & CO., 23-5, Kensington Park Road, London, W.11.	"L'Exquisite"	12×16	60 W	Three-heat switch	White	Flannelette	Complete with washable cover, two thermostats	£1 19 5	£0 8 1
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1.	"Sleepsafe" U.95748	54×30	67 W	Single-heat	Natural (a) or pink (b)	Flameproof cotton duck	Fibreglass element. Made to BSS. 2612	£3 5 0 (a) £3 7 8 (b)	£0 14 3 (a) £0 14 10 (b)
	"Sleepsafe" De-luxe U.95758	54×30	67 W	Single-heat	Pink	Flameproof cotton duck, "Wincyette" covering	Fibreglass element. Made to BSS. 2612	£3 11 9	£0 15 9
THOMAS FRENCH & SONS LTD., Chester Road, Manchester, 15.	"Vesta" Model 8	54×30	91 W	Three-heat switch, four thermostats	Pink, blue and green	Flannelette	Element woven into glass fibre, B.S.I. approved	£7 4 6	£1 11 6
	"Vesta" Model 9	60×48	235 W	Multi-position thermoset switch, four thermostats	Pink, blue and green	Flannelette	Element woven into glass fibre	£11 16 6	£2 11 7
	"Vesta" Model 10	54×30	67 W	D/P switch, non-thermostatic	Pink, blue and green	Flannelette	Element woven into glass fibre, B.S.I. approved	£4 11 0	£0 19 11
	"Vesta" Model 11	60×48	142 W	Three-position switch, non-thermostatic	Pink, blue and green	Flannelette	Element woven into glass fibre	£8 4 0	£1 15 9
DAVID GRIFFIN, LTD., Wimborne Road, Poole, Dorset.	"Dee Gee" SB/SU	70×34	105 W	Three-heat switch through transformer	Pink and blue	Wool mixture	Operates at 12 V	£9 9 3	£1 0 9
	"Dee Gee" TSB/DU	70×34 (twin)	2×105 W	Three-heat switch through transformer, dual control	Pink and blue	Wool mixture	Operates at 12 V	£17 17 6	£2 1 6

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
DAVID GRIFFIN, LTD., Wimborne Road, Poole, Dorset. *(continued)*	"DeeGee" DB/DU	70×54	2×90 W	Three-heat switch through transformer, dual control	Pink and blue	Wool mixture	Operates at 12 V	£17 0 4	£1 17 8
	"Dee Gee" DB/TSU	70×54	2×90 W	Three-heat switch through transformer, dual control	Pink and blue	Wool mixture	Operates at 12 V	£18 1 4	£1 17 8
	"Riviera" RS.1 and RS.2	70×31	115 W	Three-heat switch	Pink and blue	Wool mixture	RS.1 200/220 V RS.2 230/250 V	£6 9 7	£1 8 5
	"Riviera" RD.1 and RD.2	70×48	190 W	Three-heat switch, dual control	Pink and blue	Wool mixture	RD.1 200/220 V RD.2 230/250 V	£10 6 8	£2 5 4
HALL & VERET, LTD., 434, Rochester Way, Sidcup, Kent.	"Veret" bedwarmer	9×3	6·5 W	Thermostatic	Red and black mottled container	Toughened heavy gauge Bakelite	Suppressed for radio and T.V.	£1 17 6	£0 8 3
H.M.V. HOUSEHOLD APPLIANCES, Hayes, Middlesex.	SB1	24×60	60 W	Neon on/off switch	Fawn, pink satin edge	Wool	Made to BSS. 2612	£4 10 7	£0 19 11
	DB1	43×60	108 W	Neon on/off switch	Fawn, pink satin edge	Wool	Made to BSS. 2612	£6 17 9	£1 10 3
HOLT ENGINEERING & MANUFACTURING CO., LTD., Hemco Works, 210, Stockport Road, Manchester, 13.	"Hesco"	17×11 (a), 22×14 (b), 22×14 (c)	33 W (a), 30 W (b), 60 W (c)	Single-heat switch (a & b), three-heat switch (c)	Fawn	Woollen	White linen and/or waterproof cover 5/- extra	£2 0 0 (a) £3 10 0 (b) £3 15 0 (c)	£0 8 9 (a) £0 15 0 (b) £0 16 6 (c)
	"Hesco"	47×32	125 W (a), 260 W (b)	Single-heat switch (a), three-heat switch (b)	Fawn	Woollen	White linen and/or waterproof cover £1 extra	£5 0 0 (a) £6 15 0 (b)	£1 1 11 (a) £1 9 7 (b)
	"Hesco"	60×48	520 W	Three-heat dual switch	Fawn	Woollen	White linen and/or waterproof cover 30/- extra	£12 0 0	£2 12 7
ROBERT HOLT (MIDDLESEX), LTD., Florence Road, Edmonton, N.18.	"Solwarm" No. 1	50×54	120 W	Duplicate thermostats	Cream	Cotton	Washable cover 30/- extra	£5 17 3	£1 6 3
	"Solwarm" No. 2	36×50	90 W	Single-heat and thermostats	Cream	Cotton	Washable cover 19s 11d extra	£3 12 8 (standard) £4 6 8 (special)	£0 16 4 (standard) £0 19 0 (special)
	"Solwarm" No. 3	25×50	60 W	Single-heat and thermostats	Cream	Cotton	Washable cover 17s 11d extra	£3 1 10 (standard) £3 15 9 (special)	£0 14 2 (standard) £0 17 0 (special)

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3. *Electric Bedwarmers' "Bedtime Bliss"*
4. *Denhams "Norvic" low voltage blanket with transformer*
5. *Hall & Veret bedwarmer*
6. *David Griffin "Dee Gee" low voltage blanket with transformer*

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7. *Isopad "Lana" blanket*
8. *Hurseal electric bed sheet*
9. *F. Marshall "Mar-Tex" blanket*
10. *Kelvin-Norton "Safety First" blanket with transformer*
11. *Hotpoint Premier "Dreamwell" blanket*
12. *Milliwatt model MW75 blanket*

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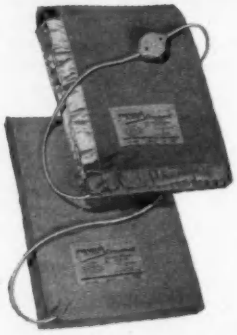

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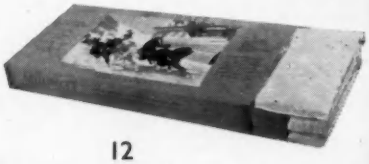

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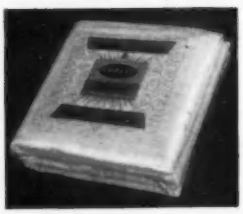
Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
ROBERT HOLT (MIDDLESEX), LTD., Florence Road, Edmonton, N.18. *(continued)*	"Solwarm" No. 4	17×50	40 W	Single-heat and thermostats	Cream	Cotton	Washable cover 13s 11d extra	£2 11 11 (standard) £3 4 0 (special)	£0 11 7 (standard) £0 14 4 (special)
	"Solwarm" No. 5	11×14 16×12	20 W	Thermostatic	Cream	Cotton	Cover available	£1 9 0	£0 6 0
	"Solwarm" L.2	50×44	130 W	Thermostatic (optional variable control)	Cream	Cotton	Washable cover 23/6 extra	£4 8 0	£0 19 6
DAVID HOPE & CO., LTD., Nugent Street, Leicester.	"Nelson"	54×33	85 W	Single-heat switch and thermostat	White	Rayon	—	£6 17 6	£1 10 2
	"Nelson"	54×33	140 W	Three-heat switch and thermostat	White	Rayon	—	£7 10 0	£1 12 11
HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, London, W.C.2.	Premier "Dreamwell" De-Luxe B.135	50×24	57 W	D/P switch, self-compensating element	Pink	Blanket material edged with satin	Covers 17/6 extra. Made to BSS. 2612	£4 6 1	£0 18 11
	Premier "Dreamwell" Standard B.105	50×24	57 W	Self-compensating element	Cream	Fleecy material	Covers 17/6 extra. Made to BSS. 2612	£3 3 6	£0 14 0
HURSEAL, LTD., 229, Regent Street, London, W.1.	"Hurseal" bed sheet, single	60×33	140 W	Three-heat switch, thermostatic	White, pink or blue	Cotton/rayon mixture	Washable	£7 10 0	£1 12 11
	"Hurseal" bed sheet, double	60×51	220 W	Three-heat switch, thermostatic	White, pink or blue	Cotton/rayon mixture	Washable, individual control each side	£12 16 0	£2 16 2
ISOPAD, LTD., 3, Rosemont Road, London, N.W.3.	"Isoblanket Lana" BS	60×80 (36×54 heated)	100 W	Three-heat switch	Pink, green and blue	Pure wool	Made to BSS. 2612	£9 16 0	£2 2 6
	"Isoblanket Lana" BS	70×80 (54×60 heated)	160 W	Three-heat switch for each half	Pink, green and blue	Pure wool	Made to BSS. 2612	£19 4 0	£4 3 2

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
ISOPAD, LTD., 3, Rosemont Road, London, N.W.3. *(continued)*	"Isoblanket Thea" single	30×56	80 W	Three-heat switch	Pink, green and blue	Raised cotton	Fireproof	£5 10 0	£1 3 10
	"Isoblanket Thea" double	50×60	140 W	Three-heat switch	Pink, green and blue	Raised cotton	Fireproof	£8 10 0	£1 16 10
	"Isoblanket Una"	30×48	60 W	Single-heat switch	Pink, green and blue	Raised cotton	Fireproof	£4 0 0	£0 17 4
KELVIN-NORTON ELECTRIC CO., LTD., Safetex Works, Barbauld Street, Warrington.	"Safety-first" single	54×30	90 W	Three-heat switch	Pastel green	Rayon and raised cotton	Low voltage through 240–24–17–12 V transformer	£11 10 3	£0 19 9
	"Safety-first" double	54×44	125 W	Three-heat switch	Pastel green	Rayon and raised cotton	Low-voltage through 240–24–17–12 V transformer	£12 19 1	£1 5 11
	"Safety-first" double De-Luxe	60×54	2×75 W	Two three-heat switches	Pastel green	Rayon and raised cotton	Low-voltage through 240–24–17–12 V transformer	£16 15 9	£1 14 3
	"Safety-first" cot	24×12	15 W	Via transformer	Pink or blue	Waterproof plastic material	Low-voltage 24 V	£2 0 2	£0 8 9
F. MARSHALL (TEXTILES), LTD., Hollins Mill, Marsh, Huddersfield.	"Martex" single	26×56	62 W	Single-heat D/P switch	Pastel pink	Cotton and rayon, flameproofed	Made to BSS. 2612	£3 14 8	£0 16 4
	"Martex" double	50×56	2×62 W	Single S/P switch each half	Pastel pink	Cotton and rayon, flameproofed	Made to BSS. 2612	£6 10 5	£1 8 7
	"Martex" single	26×50	62 W	Single-heat D/P switch	Pastel pink	Cotton and rayon, flameproofed	Mains voltage	£2 15 4	£0 12 2
	"Martex" three-quarter	37×50	62 W	Single-heat D/P switch	Pastel pink	Cotton and rayon, flameproofed	Universal voltage	£3 13 7	£0 16 1
MILLIWATT, LTD., 44, Princess Road, Regent's Park, London, N.W.1.	"Milliwatt" standard blanket	30×50	140 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£6 10 0	£1 8 2
	"Milliwatt" standard blanket	30×50	100 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£5 0 0	£1 1 8
	"Milliwatt" dual control double blanket	50×60	280 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£16 0 0	£3 9 4
	"Milliwatt" dual control blanket	50×60	200 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£13 0 0	£2 16 4
	"Milliwatt" standard pad	13½×15	80 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£3 15 0	£0 16 3
	"Milliwatt" standard pad	13½×15	40 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£2 2 0	£0 9 1
	"Milliwatt" double pad	15×26	100 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£4 15 0	£1 0 7
	"Milliwatt" double pad	15×26	50 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£3 5 0	£0 14 1
	"Milliwatt" M 75	24×50	80 W	Single-heat duplicate thermostats	Peach, blue, green and cream	Wool felt interior	Fleecy cover	£3 15 0	£0 16 3
	"Milliwatt" MW 75	24×50	80 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£3 15 0	£0 16 3
	"Milliwatt" special blanket	25×60	140 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£8 0 0	£1 14 8
	"Milliwatt" special blanket	25×60	100 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£6 10 0	£1 8 2
MODERN ELECTRICAL INDUSTRIES, LTD., Hollingworth Lane, Knottingley, Yorks.	"Warmabed" double	60×42	135 W	Single (a) or three-heat (b) switches (neon)	Honeysuckle, periwinkle blue, green and pink	All wool	All blankets made to BSS. 2612. Five-heat conversion units available, price £3 3s and £3 17s 6d (with standard lamp) extra	£10 8 0 (a) £11 12 0 (b)	£2 5 0 (a) £2 10 3 (b)
	"Warmabed" single	60×28	90 W	Single (a) or three-heat (b) switches (neon)	Honeysuckle, periwinkle blue, green and pink	All wool		£7 4 0 (a) £8 0 0 (b)	£1 11 2 (a) £1 14 8 (b)
	"Warmabed" small single	40×20	41 W	Single-heat switch (neon)	Honeysuckle, periwinkle blue, green and pink	All wool		£4 0 0	£0 17 4
	"Warmabed" "Golden Rest"	60×41½ (a), 60×28 (b)	135 W (a), 90 W (b)	Single-heat D/P switch	Honeysuckle	Flame-proofed cotton		£5 11 0 (a) £3 14 0 (b)	£1 4 0 (a) £0 16 0 (b)

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
MORPHY-RICHARDS, LTD., 50, Conduit Street, London, W.1.	"Popular" BBU Series II (a), Series III (b)	48×26	63 W (a), 91 W (b)	Single-heat switch	Pink	Cotton	Series III blankets made to BSS. 2612. Satin bound edges to all models	£2 15 6 (a) £3 0 0 (b)	£0 12 0 (a) £0 13 0 (b)
	"Popular" BCU Series II (a), Series III (b)	48×42	100 W (a), 159 W (b)	Single-heat switch	Pink	Cotton		£3 12 0 (a) £3 17 6 (b)	£0 15 7 (a) £0 16 10 (b)
	"Regent" BSU Series II (a), Series III (b)	60×26	70 W (a), 115 W (b)	Single-heat switch	Peach, pink, blue	Wool mixture (a) fleecy material (b)		£4 0 0 (a) £4 10 0 (b)	£0 17 4 (a) £0 19 6 (b)
	"Regent" BDU Series II (a), Series III (b)	60×45	130 W (a), 219 W (b)	Single-heat switch	Peach, pink, blue	Wool mixture (a) fleecy material (b)		£6 0 0 (a) £6 10 0 (b)	£1 6 0 (a) £1 8 2 (b)
	"Imperial" BEU Series II (a), Series III (b)	60×28	70 W (a), 124 W (b)	Three-heat switch	Peach, pink, blue	Wool mixture (a) fleecy material (b)		£5 5 0 (a) £5 12 6 (b)	£1 2 9 (a) £1 4 5 (b)
	"Imperial" BFU Series II (a), Series III (b)	60×48	130 W (a), 228 W (b)	Three-heat switch	Peach, pink, blue	Wool mixture (a) fleecy material (b)		£7 10 0 (a) £8 0 0 (b)	£1 12 6 (a) £1 14 8 (b)
MOSSLEY BLANKET & CARPET CO., LTD., Kosywol House, Mossley, Nr. Manchester.	"Kosywol" single	54×27	75 W	Neon (a) or non-illuminated (b) D/P switch	Rose, blue, green	Fibro blend wool content	Waterproof element	£2 14 4 (a) £2 12 3 (b)	£0 12 2 (a) £0 11 3 (b)
	"Kosywol" double	54×48	150 W	Neon (a) or non-illuminated (b) D/P switch	Rose, blue, green	Fibro blend wool content	Waterproof element	£4 18 2 (a) £4 14 1 (b)	£1 1 4 (a) £1 0 5 (b)
	"Kingfisher" single	54×27	75 W	Neon D/P switch	Red or blue	All wool velour	Waterproof element	£4 3 4	£0 18 0
	"Kingfisher" double	54×48	150 W	Neon D/P switch	Red or blue	All wool velour	Waterproof element	£6 8 4	£1 7 10
	"Kosywol" L.V.1 single	54×27	75 W	24 V on/off switch	Rose, blue, green	Fibro blend wool content	Three-heat, low-voltage control unit £6 13s 6d extra	£3 15 0	£0 16 3
	"Kosywol" L.V.2 double	54×48	150 W	24 V on/off switch	Rose, blue, green	Fibro blend wool content	Three-heat, low-voltage control unit £6 13s 6d extra	£5 5 10	£1 2 11
NORRAND, LTD., Clayton Lane, Bradford, 5, Yorkshire.	"Westminster"	54×27	67 W	Switched, thermal balance	Pink	Fleecy cotton, bias bound	Three-year guarantee, washable cover 12/11	£2 9 0	£0 10 7



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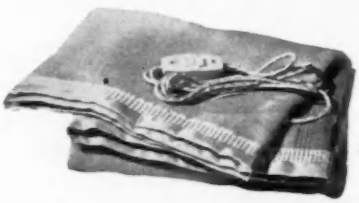

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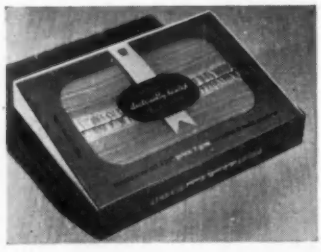

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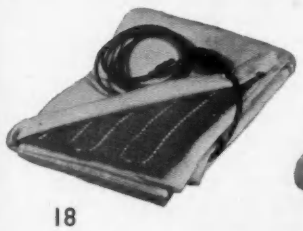
13. *Stanley Bros. "Cumfee" blanket*
14. *Morphy-Richards Series III "Regent" blanket*
15. *Pifco "Popular" blanket*
16. *Philips single-bed blanket*
17. *Sutcliffe & Clarkson "Little Gem" blanket*

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2.	EA.1213 single	60×28	75 W	Three-heat switch	Peach	Pure wool	Natural heat dissipation	£6 0 6	£1 6 6
	EA.1223 double	60×48	130 W	Three-heat switch	Peach	Pure wool	Natural heat dissipation	£9 9 5	£2 1 7
PIFCO, LTD., Watling Street, Manchester, 4.	"Favourite" 1267 single	48×26	56 W	Self-compensating element	Gold, pink and eau-de-nil	Heavy cotton twill	Satin binding. Made to BSS. 2612	£2 15 4½	£0 12 1½
	"Favourite" 1268 double	48×40	90 W	Self-compensating element	Gold, pink and eau-de-nil	Heavy cotton twill	Satin binding. Made to BSS. 2612	£3 11 9	£0 15 9
	"Popular" 1167 single	60×24	63 W	Self-compensating element	Gold, pink and eau-de-nil	Wool and cotton mixture	Satin binding. Made to BSS. 2612	£4 0 0	£0 17 6
	"Popular" 1168 double	60×42	120 W	Self-compensating element	Gold, pink and eau-de-nil	Wool and cotton mixture	Satin binding. Made to BSS. 2612	£6 0 0	£1 6 4
	"De-Luxe" 2263 single	62×28	120 W	Thermostatic	Gold, peach, powder blue	Pure wool	Satin binding. Made to BSS. 2612	£7 3 11	£1 11 7
	"De-Luxe" 2264 double	62×42	186 W	Thermostatic	Gold, peach, powder blue	Pure wool	Satin binding. Made to BSS. 2612	£10 7 11	£2 5 7
"SLEEP CONTENT" APPLIANCES, Radiant Works, 9, South Parade, Huddersfield.	"Sleep Content"	50×26	75 W	Self-compensating element	White, pink binding	Cotton and wool mixture	Triple safety factors to BSS. 2612	£2 9 0	£0 10 9
	"Sleep Content"	52×38	100 W	Self-compensating element	White, pink binding	Cotton and wool mixture	Triple safety factors to BSS. 2612	£3 12 8	£0 15 11
STANLEY BROS. ALDERSHOT, LTD., North Lane, Aldershot.	"Cozy"	60×27	110 W (a) and 150 W (b)	Thermostatic, single (a) and three-heat (b)	White	Cotton	Cover available 20/- extra	£5 0 0 (a) £6 8 0 (b)	£1 1 8 (a) £1 7 9 (b)
	"Cozy"	50×54	190 W	Three-heat thermostatic	White	Cotton	Cover available 32/- extra	£10 0 0	£2 3 4
	"Cozy"	16×12	35 W	Single-heat	White	Cotton	Detachable cover included	£1 16 0	£0 7 10
	"Cozy"	16×22	50 W	Single-heat	White	Cotton	Detachable cover included	£2 10 0	£0 10 10
	"Cozy"	16×24	75 W	Three-heat	White	Cotton	Detachable cover included	£3 12 0	£0 15 7
	"Cumfee"	50×25	65 W	Self-compensating element	White	Cotton	Cover available 15/- extra	£2 9 0	£0 10 7
	"Cumfee"	60×27	90 W	Self-compensating element	White	Cotton	Cover available 20/- extra	£3 3 0	£0 13 8
	"Cumfee"	50×40	110 W	Self-compensating element	White	Cotton	Cover available 28/- extra	£3 10 0	£0 15 2
SUTCLIFFE & CLARKSON, LTD., Spa Street Works, Burnley, Lancs.	"Little Gem"	53×25	60 W	On/off switch	Pink	Cotton blanket material	P.V.C. insulated elements	£2 8 10	£0 10 8
	VR.1	53×25	60 W	Illuminated on/off switch	Blue	Wool mixture	P.V.C. insulated elements	£4 5 2	£0 17 9
	VR.2	53×40	95 W	Illuminated on/off switch	Blue	Wool mixture	P.V.C. insulated elements	£5 11 10	£1 3 4
	VR.3	53×40	95 W	Three-heat switch	Blue	Wool mixture	P.V.C. insulated elements	£5 15 2	£1 4 0
	HS.3	57×26	90 W	Three-heat, thermostatic	Pink	Wool mixture	—	£5 1 4	£1 1 2
	HD.3	57×40	140 W	Three-heat, thermostatic	Pink	Wool mixture	—	£6 0 7	£1 5 2
	SVT	60×26	95 W	Variable heat, thermostatic	Blue	Wool mixture	P.V.C. insulated elements	£6 1 8	£1 5 4
	DVT	60×42	150 W	Variable heat, thermostatic	Blue	Wool mixture	P.V.C. insulated elements	£7 16 5	£1 12 7
TELSEN ELECTRIC CO. (1935), LTD., 9, Fitzgeorge Street, Collyhurst, Manchester, 9.	"Nelson"	60×30 (single) 60×90 (double)	100 W	Thermostatic. Double size has the twin control feature	Green, blue, pink and peach	Witney blanket finish	Washable, rapid heating	£6 17 6 (single) £11 17 6 (double)	£3 2 3 (single) £5 6 3 (double)

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
THERMEGA, LTD., 37, Thurloe Street, London, S.W.7.	"Thermega" pad P.1612/3	16×12	90 W	Three-heat thermostatic	White	Wool/felt cotton	Complete with covers. Made to BSS. 2612	£3 5 8	£0 14 3
	"Thermega" pad P.2416/3	24×16	110 W	Three-heat thermostatic	White	Wool/felt cotton	Complete with covers. Made to BSS. 2612	£5 10 0	£1 3 10
	"Thermega" domestic blanket single T.5430	54×30	110 W	Single-heat thermostatic	White, blue binding	Pure wool moth proofed	Covers 27/- extra. Made to BSS. 2612	£7 0 0	£1 10 4
	"Thermega" domestic blanket double T.6048	60×48	200 W	Single-heat thermostatic	White, blue binding	Pure wool moth proofed	Covers 48/- extra. Made to BSS. 2612	£11 0 0	£2 7 8
	"Thermega" bedwarmer single W.5430	54×30	80 W	Single-heat non-thermostatic	White	Pure wool moth proofed	Covers 27/- extra. Made to BSS. 2612	£5 15 0	£1 4 11
	"Thermega" bedwarmer double W.6048	60×48	140 W	Single-heat non-thermostatic	White	Pure wool moth proofed	Covers 48/- extra. Made to BSS. 2612	£9 10 0	£2 1 2
	"Thermega" "Crescent" single U.5025	50×25	62 W	Single-heat non-thermostatic	Peach	Raised cotton	Made to BSS. 2612	£2 17 6	£0 12 6
THERMOLECTRICS, LTD., Chapel Works, Church Street, Hampton-on-Thames.	"Siesta" SBA and SBA-K	60×30	90 W	Natural heat dissipation	Rose, pastel pink	Mixture	Neon indicator switch. (SBA-K made to BSS. 2612)	£3 2 0 £3 10 0 (SBA-K)	£0 13 7 £0 15 4 (SBA-K)
	"Siesta" DBA and DBA-K	60×50	135 W	Natural heat dissipation	Rose, pastel pink	Mixture	Neon indicator switch. (DBA-K made to BSS. 2612)	£5 0 0 £5 10 0 (DBA-K)	£1 1 11 £1 4 1 (DBA-K)
THERMOSET APPLIANCES, LTD., Chapel Works, Failsworth, Manchester.	"New Era" (standard)	50×30	85 W	Single-heat. Variable heat control unit 39/6 extra	Pale green and cream	"Duplex" material (cotton)	Cover 16/- extra. Made to BSS. 2612	£5 16 0	£1 5 6
	"New Era" (twin)	60×48	2×80 W	Single-heat. Variable heat control unit 39/6 extra	Pale green and cream	"Duplex" material (cotton)	Cover 24/- extra	£10 0 0	£2 3 10
	"New Era" (single)	60×24	85 W	Single-heat. Variable heat control unit 39/6 extra	Pale green and cream	"Duplex" material (cotton)	Cover 16/- extra. Made to BSS. 2612	£5 16 0	£1 5 6
	"Regent"	40×28	80 W	Single-heat. Variable heat control unit 39/6 extra	Pale green and cream	"Duplex" material (cotton)	Cover 14/- extra	£4 16 0	£1 1 0
	"Cozee"	60×28	75 W	Single-heat. Variable heat control unit 39/6 extra	Pale green	"Duplex" material (cotton)	Cover 18/- extra. Made to BSS. 2612	£3 15 0	£0 16 5
	"Everest"	48×26	58 W	Single-heat. Variable heat control unit 39/6 extra	Pale green	Cotton	Cover 18/- extra. Made to BSS. 2612	£2 16 0	£0 12 4
	"Everest"	48×44	92 W	Single-heat. Variable heat control unit 39/6 extra	Pale green	Cotton	Cover 22/- extra. Made to BSS. 2612	£4 1 0	£0 18 0
	"Favourite" pad	18×14	55 W	Single-heat	Pale green and cream	"Duplex" material (cotton)	—	£2 10 0	£0 11 0
WARMEX, LTD., 375, Milton Road, Cambridge.	"Warmex" Standard single	50×24	80 W	Self-compensating element, single-heat	Cream	Cotton	Illuminated safety switch	£2 14 0	£0 11 0
	"Warmex" Standard large	50×30	100 W	Self-compensating element, three-heat	Cream	Cotton	Illuminated safety switch	£5 8 0	£1 2 0
	"Warmex" Standard double	50×48	160 W	Self-compensating element, single (a) and three-heat (b)	Cream	Cotton	Illuminated safety switch	£5 15 4 (a) £8 5 6 (b)	£1 2 8 (a) £1 13 6 (b)
	"Warmex" De-Luxe single	50×24	80 W	Thermostatic, single-heat	Cream	Cotton	Illuminated safety switch	£3 8 8	£0 14 4
	"Warmex" De-Luxe large	50×30	100 W	Thermostatic, three-heat	Cream	Cotton	Illuminated safety switch	£6 11 3	£1 3 9

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
WARMEX, LTD., 375, Milton Road, Cambridge. *(continued)*	" Warmex " De-Luxe double	50×48	160 W	Thermostatic, single (a) and three-heat (b)	Cream	Cotton	Illuminated safety switch	£6 17 4 (a) £8 19 1 (b)	£1 8 8 (a) £1 15 11 (b)
WARRANTY ELECTRICAL PRODUCTS CO., 210, West End Lane, London, N.W.6.	DBSA (Standard) and DBSA4 (De-Luxe)	60×50	300 W	Thermostatic and two infinitely variable switches	Cream, pink, sky blue, camel, green	Flannelette	" Magic Brain " switches, washable cover	£16 12 6 (DBSA) £19 3 6 (DBSA4)	£3 7 6 (DBSA) £3 16 6 (DBSA4)
	DBA (Standard) and DBA4 (De-Luxe)	50×50	250 W	Thermostatic and two infinitely variable switches	Cream, pink, sky blue, camel, green	Flannelette	" Magic Brain " switches, washable cover	£14 3 0 (DBA) £16 4 0 (DBA4)	£2 17 0 (DBA) £3 6 0 (DBA4)
	SA (Standard) and SA4 (De-Luxe)	60×24	150 W	Thermostatic and infinitely variable switch	Cream, pink, sky blue, camel, green	Flannelette	" Magic Brain " switch, washable cover	£7 7 6 (SA) £8 4 6 (SA4)	£1 10 0 (SA) £1 15 6 (SA4)
	A (Standard) and A4 (De-Luxe)	48×24	125 W	Thermostatic and infinitely variable switch	Cream, pink, sky blue, camel, green	Flannelette	" Magic Brain " switch, washable cover	£6 7 0 (A) £7 7 6 (A4)	£1 5 6 (A) £1 10 0 (A4)
	B	24×24	75 W	Thermostatic and infinitely variable switch	Cream, pink, sky blue, camel, green	Flannelette	" Magic Brain " switch, washable cover	£4 7 0	£0 18 0
	C	12×24	60 W	Thermostatic and infinitely variable switch	Cream, pink, sky blue, camel, green	Flannelette	" Magic Brain " switch, washable cover	£3 6 6	£0 13 6
	DBSA3	60×50	300 W	Thermostatic and two three-heat switches	Cream, pink, sky blue, camel, green	Flannelette	Washable cover	£15 7 0	£3 3 0
	DBA3	50×50	250 W	Thermostatic and two three-heat switches	Cream, pink, sky blue, camel, green	Flannelette	Washable cover	£13 5 0	£2 14 0
	SA3	60×24	150 W	Thermostatic and three-heat switch	Cream, pink, sky blue, camel, green	Flannelette	Washable cover	£6 17 3	£1 7 9
	A3	48×24	125 W	Thermostatic and three-heat switch	Cream, pink, sky blue, camel, green	Flannelette	Washable cover	£5 10 0	£1 2 6
WYE VALLEY HAND WEAVERS, Ross-on-Wye, Herefordshire.	" Wye Valley "	54×31	70 W	Single-heat illuminated safety switch	Cream (a), blue, green or gold (b)	Flannelette cover	Hand woven element. Covers optional, white 20/- striped 22/-	£3 18 3 (a) £4 1 7 (b)	£0 17 8 (a) £0 18 4 (b)
	" Wye Valley "	54×60	140 W	Single-heat illuminated safety switch	Cream (a), blue, green or gold (b)	Flannelette cover	Hand woven element. Cover optional, white 40/-	£7 16 4 (a) £8 2 10 (b)	£1 15 2 (a) £1 16 8 (b)
	" Wye Valley "	50×38	79 W	Single-heat illuminated safety switch	Cream (a), blue, green or gold (b)	Flannelette cover	Hand woven element	£4 9 4 (a) £4 13 6 (b)	£1 0 2 (a) £1 1 0 (b)
	" Wye Valley " De-Luxe	49×38	79 W	Single-heat illuminated safety switch	Peach	Vynide cover	Cover can be sponged down	£5 5 8	£1 3 10



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18. *Wye Valley Hand Weavers blanket*

19. *Thermoset Appliances " New Era " blanket with infinitely variable heat control unit*

20. *Thermega " Crescent " blanket*

Financial Section

STOCKS and SHARES

ON balance, the gilt-edged market of the Stock Exchange stood up very well to the anxieties arising out of the first stages of the Middle East crisis. Initially, this caused a general revision of ideas about the likelihood of further reductions in Bank Rate in the near future. Taking into account, however, the evidence of a marked change in Government policy towards the encouragement of industrial re-expansion, anticipations of cheaper money were by no means abandoned. Evidence of this is the air of expectancy which has continued to develop each Thursday morning, the traditional time for Bank Rate announcements. Although prices of Government securities have been held well above the quotations ruling earlier in the year, they are still considerably below the level that has come in recent years to be regarded as normal.

British Electricity Stocks

Among the five principal market issues of the British Electricity Authority, a notable point is the very large discounts at which the two 3 per cent stocks can still be bought. Quoted recently at about 75½ for the issue redeemable between 1968-73, and 73 for the other, redeemable 1974-77, they guarantee the present buyer a tax-free capital profit of more than 30 per cent on the money invested, upon the repayment of the stocks at 100 within maximum periods of 15 and 19 years, respectively. Current yields are of course correspondingly moderate at not much over 4 per cent. For a higher current yield the 4½ per cent British Electricity stock, redeemable 1974-79, is the best proposition of the five, giving a return of nearly 5 per cent at a price of 87, while the 4½ per cent stock, 1967-69, at 93 gives over 4¾ per cent on the money.

Company News

Electrical Components 5s shares were marked up initially to 8s after the company's announcement of an improvement in the net earnings for 1957-58 to £126,000 and the maintenance of the dividend at a well-covered 12½ per cent, on the basis of which the yield works out at a fraction over 7¾ per cent. The statement included notice of the acquisition of the majority of the capital of Santon (Wholesale), a company conducting in Wales a business similar to that of the present group. At the Dubilier Condenser Company's annual meeting, the business was said to be operating on a comparatively short-term order book and competition was described as keen; but substantial orders were being received and the chairman thought that satisfactory results could be expected this year, in the absence of any general deterioration in trade. Globe Telegraph & Trust hope to post allotment letters in respect of the scrip and "rights" issues (both on a one-for-twelve basis) on the 25th of this month.

Recent statements from the chairmen of John Thompson and Head, Wrightson & Co. have thrown light upon the outlook for some of the members of the principal atomic power construction groups. In the case of John Thompson, whose profits for 1957 came out a little under the exceptionally high figures of the previous year, the chairman expressed the opinion at the annual meeting that the capacity of the boiler-making industry was now at least adequate for all power station requirements, but added that the variety of the group's products reduced its dependency upon that source of orders. While there seemed to be little possibility of wider profit margins, he was able to report an improvement of 9 per cent in output and a large increase in orders for the first quarter of the current year. In general the outlook was described as not unsatisfactory. At 24s 6d, the company's 5s shares show a yield of just over 5 per cent on a dividend of 25 per cent, covered 2½ times over by last year's net surplus of earnings.

Head, Wrightson

Shareholders of Head, Wrightson & Co., whose annual meeting was held last week, were advised that in the absence of a widespread upturn of trade at home and abroad, the improvement in the company's trading results could not be expected to continue indefinitely. Over the past decade or so the expansion of the business (financed from the group's own resources) has produced a practically unbroken upward curve in the earnings record, and members are receiving this year their seventh successive increase in dividend, which has nevertheless remained throughout in the strictly conservative class. To his cautionary remarks about the further prospects, Mr. Richard Miles added in his report references to the benefits expected to accrue from the heavy capital expenditure of recent years upon broadening the basis of production and raising its efficiency. There is a yield of 4¼ per cent on the 5s shares at a price of 20s 6d.

Commercial T.V.

Some of the steam has gone out of the remarkable burst of activity, noted here last week, in the shares of companies financially interested in the fortunes of commercial television, but this section of the market has continued to claim a lot of attention. Unofficial dealings in the £1 "A" shares of Associated Television, whose announcement of a £4 million profit for 1957-58 inspired much of the activity, took place at prices up to 149s, despite an indication at the annual meeting that it was not the intention to seek an official quotation for the time being. Indirect interest in this situation has extended to include the 5s deferred shares of Pye, Ltd., who are shown as shareholders in the company, and the 5s ordinary shares of Reliance Clifton Cables, who are said to have a material stake in Associated Television through a subsidiary, Clifton Securities.

Rediffusion

Under its former title of Broadcast Relay Service, the Rediffusion company had a notable record of expansion which produced an increasingly good return to its shareholders. In his review at the annual meeting a fortnight ago, the chairman was able once more to record trading profits for the year ended last March. The dividend was maintained, in effect, at 12½ per cent, tax-free, which produces a return on the shares, at a price of around 28s 6d, of a fraction under 4 per cent. This comparatively small yield is related no doubt to the company's substantial investment in Associated Rediffusion, the contractors for the mid-week television broadcasts from London. Shareholders of Rediffusion were told at the meeting that the huge losses sustained by the T.V. enterprise in its early stages are now being replaced by profits on a commensurate scale, and that the company could be said (in the chairman's phrase) to have "backed a winner."

Hoover's Interim

In declaring an interim dividend of 10 per cent (as before) on account of the current year, the Hoover directors report that sales in the first half of this period were 27 per cent higher than in the corresponding six months of 1957. In the second quarter the purchase tax reductions provided a stimulus. Group profits for the half-year were up by about 25 per cent at £2,107,000, although the improvement in the net profit, to £852,000, was limited to 12 per cent as a result of a substantially higher tax provision. Prospects for home sales in the second half of the year are regarded by the directors as satisfactory, although the high rate achieved in the second quarter is not expected to be sustained, and export conditions are becoming increasingly difficult. The 5s shares were quoted at 43s after these statements.

Owing to the incidence of Bank Holiday there are no share lists this week but they will appear as usual in our next issue.

Tube Investments Organisation

Tube Investments, Ltd., has issued "This is TI To-day," a booklet which lists its home subsidiary and associate companies and their main products.

REPORTS and DIVIDENDS

Metal Industries, Ltd.—The annual meeting was held on 30th July, Sir Charles Westlake (chairman) presiding. In his address to stockholders, Sir Charles said that despite trading conditions considerably more difficult than a year ago, the gross profit for the first twelve weeks of the current financial year had been very close to that of the corresponding period of 1957. It was too early, however, to regard this as an indication of the results to be achieved in the full year. He intended to publish an interim profit statement in a few months' time. He referred to the statement in his review of the year that they had under consideration the development of the group by the entry into fields allied or complementary to those in which they were at present engaged. To this end, the board were now engaged in negotiations for the acquisition of two businesses; other propositions are at earlier stages of investigation.

Electrical Components (Holdings), Ltd.—The preliminary statement shows a gross trading profit for the year to 31st March last of £271,044, as compared with £259,776 for 1956-57. Taxation absorbs £149,419 and the net balance is £125,907 (against £118,727). It is proposed to pay a final dividend of 7½ per cent, making 12½ per cent for the year (unchanged). The final dividend is also payable on 138,200 additional shares issued on 29th July.

The company has acquired just over 90 per cent of the share capital of Santon (Wholesale), Ltd., which carries on a similar business to that of the other subsidiary companies of the group, at 34, Bridge Street, Newport, Mon., in exchange for the issue to that company's shareholders of ordinary shares of 5s each, in Electrical Components (Holdings). Santon (Wholesale), Ltd., will continue to operate under the control of its managing director, Mr. R. E. Silvey. Mr. K. R. Taylor will also remain as a director, and they will be joined by Mr. A. T. Haywood and Mr. C. C. Scott, the managing directors of Electrical Components (Holdings).

Venner, Ltd.—The main figures in the accounts for 1957 were given in our issue of 25th July. In his circulated statement, Mr. A. A. Rowse (chairman) says that trading conditions during the year under review have been difficult. They were, however, fortunate in some respects. Australia came into the market again with substantial purchases; the aircraft division benefited by the commercial acceptance of the engine unit to which they contribute; and the parking meter is being incorporated into the "British way of life." All these factors have contributed to the improved results. The electronics division is making encouraging progress. It is concentrating on a limited field for the moment, but the products which have been developed are commanding a wide acceptance. Since the close of the year, the installation of parking meters has commenced in England and sales overseas are expanding.

Hoover, Ltd.—The half-yearly statement to 30th June last shows a profit, before taxation, of £2,107,000, as compared with £1,686,000 for January-June, 1957. Estimated taxation is £1,241,000, and after deducting £14,000, proportion of profits of subsidiaries attributable to minority shareholdings, the balance available to Hoover is £852,000 (£763,000). An interim dividend of 10 per cent is declared (unchanged).

The directors state that the sales in the home market were stimulated in the second quarter of the year by the reduction in purchase tax, and for the six months they were 27 per cent higher than for the corresponding period of the previous year. Exports showed a small increase (3 per cent). It is stated that the prospects in the home market for the second half of the year, while not expected to continue at the high level of the second quarter, look satisfactory. The export situation, however, is becoming increasingly difficult and the uncertainty created by the lack of any clear announcement on the European Free Trade Area adds to the problem.

The Pirelli-General Cable Works, Ltd., reports that after providing £451,047 for taxation, the net profit for the year ended 31st March last is £433,437, as compared with £332,130 for the preceding year. General reserve receives £300,000 and the dividend for the year is maintained at 15 per cent. The balance carried forward is £1,699,352 (against £1,772,191 brought in).

New Companies

Wynbourne Electrical Products, Ltd.—Registered 18th June. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, etc. Solicitors: I. M. Wimbourne & Co., 34, Great James Street, W.C.1.

C. W. Walker & Co. (Bradford), Ltd.—Registered 18th June. Capital £1,000. Designers, manufacturers of and dealers in radio and television sets, electrical apparatus, etc. Directors: C. W. Walker, Mrs. Lilian Walker (secretary) and P. D. Walker. Regd. office: 1, Piccadilly, Bradford.

Powertron, Ltd.—Registered 18th June. Capital £100. Manufacturers, wholesalers, retailers, exporters and importers of and dealers in electrical and other accessories and components for motor and other vehicles, etc. Solicitors: Stephenson, Harwood & Tatham, Saddlers' Hall, Gutter Lane, E.C.2.

Webmore Co., Ltd.—Registered 13th May. Capital £2,000. Wholesale and retail dealers and manufacturers of wireless, telephonic and television receiving sets, etc. Directors: G. C. Goodman and A. E. Day. Regd. office: High Street Works, Astwood Bank, Redditch.

Spire Electrical Appliances, Ltd.—Registered 15th May. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, etc. P. F. Fuchs is the first director. Regd. office: Chancery House, Chancery Lane, W.C.2.

J. Connare & Co., Ltd.—Registered 21st May. Capital £5,000. Electricians, etc. J. M. Connare is the first director. Regd. office: 84, The Broadway, Chesham, Bucks.

W. H. Flinn & Co., Ltd.—Registered 2nd May. Capital £1,500. Wholesale distributors, importers, exporters and manufacturers of and agents for electrical and mechanical plant and equipment, radio, etc. Directors: W. H. Flinn, W. E. Flinn and Mrs. Winifred J. Flinn. Regd. office: 18, Princess Road, Moss Side, Manchester, 14.

T. & W. Electrical, Ltd.—Registered 15th May. Capital £100. Electrical, lighting and radio engineers, etc. Directors: S. A. Tapp, S. T. Wiles and D. T. O'Gorman. Regd. office: 77c, Sewardstone Road, E.4.

Ashgrove Instruments, Ltd.—Registered 4th June. Capital £500. Manufacturers of and dealers in instruments, electronic, electrical and mechanical apparatus, etc. Directors: D. J. Grover, R. J. Halford and A. A. Norman. Regd. office: 51, Station Crescent, Ashford, Middx.

Ramould, Ltd.—Registered 28th May. Capital £100. Electronic and automation engineers, etc. Solicitors: Dehn & Lauderdale, 63a, Station Road, West Drayton, Mdx.

Electrical & Electronic Engineering, Ltd.—Registered 30th May. Capital £100. Directors: J. A. Fraser, F. L. Sargeant, A. F. Quantrill, P. M. Sabersky and J. H. Sutherland. Regd. office: 79, Mount Street, W.1.

Smith's Electrical Services (Domestic Appliances), Ltd.—Registered 2nd June. Capital £3,000. Directors: E. F. Smith and Evelyn Smith. Regd. office: Suffolk House, Suffolk Street, Birmingham, 1.

Five-Star Electrics, Ltd.—Registered 2nd June. Capital £100. Manufacturers of and dealers in electrical equipment, etc. N. E. Law is the first director. Regd. office: 10, Bexley Square, Salford, 3.

E. O. Appleton & Co., Ltd.—Registered 21st May. Capital £100. Electrical engineers and contractors, manufacturers of and dealers in wireless apparatus, etc. Directors: E. O. Appleton and Mrs. Kathleen T. Appleton. Regd. office: 78, Blackfen Road, Sidcup, Kent.

George Pill, Ltd.—Registered 6th June. Capital £1,000. To acquire the business of electrical engineers and radio and television dealers now carried on by G. N. L. Pill and Helen L. Pill at 49, Cobourg Street, Plymouth, as George Pill & Partners. Directors: G. N. L. Pill (chairman) and Helen L. Pill. Regd. office: 49, Cobourg Street, Plymouth.

Liquidation

Hamco Metal Pressings, Ltd., electrical instrument makers and general engineers, 91, Moorgate, London, E.C.2.—Winding up voluntarily. Liquidator, Mr. H. W. Pitt, 100, Park Street, London, W.1, appointed 16th July. Particulars of claims to the liquidator by 5th September.

Bankruptcies

J. V. Lythgoe and **T. O'Brien**, carrying on business in co-partnership, formerly at 385, Halifax Road, Rochdale, but lately at 94-96, Cheetham Street, Rochdale, under the name of Swift Clean Vac Shop, as electrical appliance dealers.—Receiving order made 22nd July on debtors' own petition.

A. J. L. Fleming, 54, Fore Street, Buckfastleigh, Devon, electrical engineer.—Trustee, Mr. F. B. Goodman, 24, Lockyer Street, Plymouth, Official Receiver, released 18th July.

K. J. Rodgers, carrying on business under the style of Castle Engineering at The Crofts, Moorgate, Rotherham.—Receiving order made 25th July on debtor's own petition.

C. E. Purcell, 81, Addison Road, London, W.14, electrical contractor, lately carrying on business at 13, Wrotham Road, Gravesend, under the style of Edward Purcell & Son.—Trustee, Mr. A. T. Tuck, 280a, High Street, Rochester, Official Receiver, released 24th July.

GENERATION AND DEVELOPMENT

Extension of Scottish Schemes

Additions to existing schemes at Storr Lochs in Skye and on the River Moriston in Inverness-shire, proposed by the North of Scotland Hydro-Electric Board, have now been confirmed by the Secretary of State. The additions are estimated to cost £740,000, of which £690,000 will be in respect of the Moriston project.

At Storr Lochs the head waters of the River Chracaig will be diverted into Loch Fada. This will allow the Board to increase the output of electricity from the Storr Lochs project by some 1,300,000 kWh annually. In Glen Moriston the works proposed will extend the catchment area regulated by Loch Cluanie, the main reservoir of the Moriston scheme, and will increase the output of the two upper generating stations by some 12,200,000 kWh annually.

Remotely Controlled Substations

The Yorkshire Electricity Board's new substation at Ledstone is the tenth substation to be remotely controlled from the control room at Low Road, Leeds, some ten miles away. The control room was established about ten years ago to provide centralised operational control for the very extensive distribution network in and around Leeds.

The Standard Telephones & Cables supervisory remote control system uses coded signalling and only one pair of G.P.O. wires is required for the conveyance of the necessary intelligence in both directions between the control room and the Ledstone substation. Among the facilities provided for the control engineer at Low Road are remote control and indication of the position of circuit-breakers and other switches, indication of fault conditions on the plant and network, and metering of the voltages and circuit loadings.

Douglas Engineer's Report

The output from the generating station of the Borough of Douglas electricity undertaking in the year ended 31st March, 1958, was 27,923,722 kWh and the kWh sold in the area of supply rose by 2,329,394, or 9·98 per cent, and the number of consumers by 46. In his report the borough electrical engineer and manager, Mr. C. Anderson, records that the maximum load on the generating station was 9,600 kW, which included 1,450 kW exported to the Isle of Man Electricity Board. Despite the rise in output the number of employees is still below the number employed in 1939.

The total revenue for the year amounted to £307,727 and the expenditure to £214,806, leaving a gross profit of £92,921. After meeting loan charges there was a net deficit of £3,711.

OVERSEAS

A Good Year in Christchurch

The fifty-fifth annual report of the Christchurch, New Zealand, Municipal Electricity Department records that the year ended 31st March, 1958, was the first for a long period during which no restrictions or threats of restrictions on electricity supplies were experienced, and as a consequence there was a steady growth in the load. The growing confidence of both supplier and consumer in the certainty of supply is shown by the fact that electricity is securing practically all the load resulting from new housing construction and a liberal share of the increases in load from existing consumers.

During the year the department increased its sales of electricity to 376 million kWh; this was 25·1 per cent greater than last year's restricted figure, and gives an average growth of 9·4 per cent over the two years. The department also coped with a record peak load of 100,058 kW, an increase of 16 per cent on the previous maximum, and with only 70 per cent of the relays on water heaters in operation at this date achieved a load factor of 47·4 per cent, compared with 44·6 per cent in 1956-57. By the end of the year the reduction in the evening peak load obtainable by means of the ripple control equipment was more than 10,000 kW. The increased sales of electricity and appliances enabled an overall surplus of £48,780 to be earned.

Cheaper Electricity in N.S.W.

The Minister for Local Government, Mr. J. B. Renshaw, has announced that bulk power charges in New South Wales will be reduced later this year. He could not say how much the reduction would be, but it would be made possible because more efficient generating plant operating in many parts of the State had reduced costs.

Rocky Mountains Project

The Vancouver correspondent of *The Times* reports that Dr. A. Wenner-Gren, the Swedish industrialist, has said that engineering studies for a proposed hydro-electric development in the Rocky Mountains trench had yielded better results than were expected. "He and directors from London and Sweden are to go over the preliminary surveys with the consulting engineers, the British Thomson-Houston group. If all engineering and economic factors prove favourable and the project is carried out in full it will involve the world's largest single hydro-electric installation—estimated at four million horsepower — coupled with integrated development of railways, mines, pulp and paper mills and associated industries."

Progress on Ohakuri Project

Preparations for the diversion of the Waikato River at the Ohakuri hydro-electric project are now well in hand and should be completed within the next few weeks, the Minister of Works, Mr. Watt, announced on 24th July. The concrete-lined diversion tunnel is 1,300ft long and 25ft in diameter. The station, the sixth in the Waikato chain, will have an installed capacity of 84 MW, with provision for a fourth unit which could bring peak capacity to 112 MW. It will be the next hydro-electric station to be completed after Atiamuri (84 MW) and will be followed by Waipapa (50 MW). Ohakuri and Waipapa are both scheduled to produce their first electricity by 1961.

Victorian Electricity Finance

The State Electricity Commission of Victoria says that higher charges are needed to finance capital works because of insufficient loan money. The chairman, Mr. W. H. Connolly, has said that all the extra revenue will be used on new works. The Commission plans to spend £26 million on capital works expansion this year.

On a 2,000 yd stretch of dual carriageway between Bowling and Dumbarton, Scotland, the A.E.I. Lamp & Lighting Co., Ltd., has installed 98 "SO Fifty" lanterns (medium angle beam) and five cut-off lanterns, each housing a 140 W "Mazda" sodium lamp. The "Springbank" reinforced concrete columns are served by overhead lines

INDUCTION MOTOR ANALOGUE COMPUTER

DURING the past few years many varied and specialised types of computers, both analogue and digital, have been built in the electronics laboratory of A. V. Roe & Co., Ltd., the aircraft manufacturers. Electronic techniques involved in the design of these computers are applicable not only to aircraft problems, but also to a variety of industrial uses in the engineering fields. Knowing this, Laurence, Scott & Electromotors, Ltd., engaged " Avro " to design and build a special analogue computer for dealing with induction motor design problems. This machine has now been in service for some months.

In the design of an induction motor it is essential not only to know the performance of the motor during normal load running, but also to know its performance in the

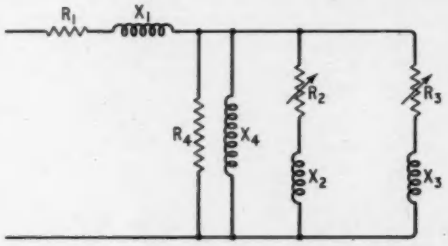


Fig. 1.—Equivalent circuit of double cage induction motor

stationary condition, i.e. start, and also during the whole of the acceleration period. The calculation of performance during start, acceleration and running conditions normally involves about ten sets of calculations, each of which may require up to four separate inversion processes in order to sum up the various parallel circuits in the equivalent diagram of an induction motor. Such calculations by normal methods, for example, by using a slide rule, can take four or five hours whereas with the computer it can be done in about ten minutes.

In conventional calculations the risk of error is considerable. With a computer, providing the initial values are set correctly on the decade switches, then the only way an error can occur is for a fault to develop on the computer. To avoid this, a standard set of test values is applied to the computer each day in order to verify its accuracy.

Apart from saving time, the computer also enables the full characteristics of the motor design to be evaluated. Irrespective of whether the designer is evolving a standard type of motor, or whether he is designing an abnormal type, with special characteristics for a particular application, he has before him a mental picture of the ideal form of torque/speed curve required. Having evaluated from his initial basic design a preliminary torque/speed curve, he can determine the necessary adjustments to this design to give the ideal or optimum curve by simply adjusting the values of the various circuit components by means of the decade switches on the computer until the required characteristics are achieved.

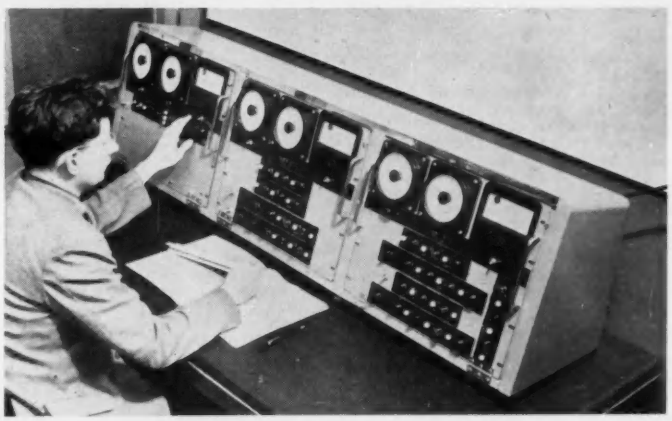
Utilising conventional methods, the designer would probably be content with values which gave him a satisfactory characteristic, whereas further experimentation or adjustment on certain parameters might give an even better design. In the past, the laborious nature of normal methods often prevented a designer going to such lengths, whereas with the computer the process is very quick, and in a matter of minutes the designer can adjust a design from values which are " satisfactory " to a design which gives the " absolute optimum " of performance.

The induction motor is the most common motor in use, but computers for dealing with other types of a.c. machines, such as series and shunt variable-speed commutator types or synchronous motors, are in the course of design and can easily be adapted to cater for any unique individual refinements included in any basic type.

Basic Design

The philosophy in the design of these computers is based on maximum operational convenience and maximum reliability. The operator does not need to have any special electronics knowledge and can concentrate on solving and exploring his motor problems without regard to how the computer works. There is no complex mathematical system necessary for the insertion or extraction of information from the computer.

The equivalent circuit normally used for induction motor design is shown in Fig. 1, and in the computer a direct analogy of this circuit is permanently connected up and is designed to deal with motors of any size. To solve a particular problem the operator sets on the machine the values of R_1 X_1 R_2 X_2 R_3 X_3 R_4 X_4, etc. These numbers are set directly on the panel mounted decade switches and each impedance can be set up to better than 1 per cent accuracy. By varying a further panel control labelled " S," the fractional slip can be varied over the range 1·0 to 0·01, and the motor performance assessed over this wide range. The variables of interest, including percentage torque, are displayed directly on high quality meters, and current, voltage, power, VA and torque measurements can be made.



The Avro induction motor analogue computer at the Manchester works of Laurence, Scott & Electromotors, Ltd.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

22806. United Kingdom Atomic Energy Authority.—Electronic valve amplifiers. 18th November, 1954. (799140.)

31756. Staatsbedrijf der Posterijen, Telegrafie en Telefonie.—Electric telegraph systems and apparatus for code conversion. 11th November, 1954. (799301.)

34832. Electric & Musical Industries, Ltd. —Variable linkage transformers. 3rd December, 1954. (799356.)

1954

23958. Sylvania Electric Products, Inc.—Electroluminescent lamp. 17th August, 1954. (799141.)

37410. Thorn Electrical Industries, Ltd. —Illumination of dials and the like. 8th December, 1955. (799142.)

1955

1432. Centre d'Etude et de Developpements de Electronique.—Electromagnetic deflecting means for cathode ray tubes. 17th January, 1955. (799426.)

2576. Bateman, S.—Electric lamp support. 11th November, 1955. (799276.)

5404. Radio Materials Corporation.—Electrical condenser. 23rd February, 1955. (799260.)

8765. Rank Cintel, Ltd.—Methods of operating electron discharge devices for generating electrical signals. 26th March, 1956. (799183.)

11898. Adalia, Ltd.—Electrical reproduction of pictures or originals. 25th April, 1955. (799491.)

13651. Adalia, Ltd.—Colour correction selector. 11th May, 1955. (799492.)

16104. Ferranti, Ltd.—Electro-acoustic delay lines. 1st June, 1956. (799201.)

16854. Gialluly, E. M. S. De.—Vibratory convertors for converting direct electric current into a.c. 10th June, 1955. (799376.)

18317. Marconi's Wireless Telegraph Co., Ltd.—Band frequency selective wave guide filters for use on very high frequencies. 9th May, 1956. (799163.)

18337. Philips Electrical Industries, Ltd. —Circuits for use in television receivers. 24th June, 1955. (799132.)

22181. General Electric Co.—Insulated electrical conductors. 2nd August, 1955. (799187.)

26855. Claude Paz et Vissiaux.—Process for manufacturing a gaseous electric-discharge lamp. 20th September, 1955. (799434.)

27595. Collins Radio Co.—Radio-frequency tuning devices. 28th September, 1955. (799165.)

29892. British Thomson-Houston Co., Ltd.—Signalling systems. 3rd October, 1956. (799231.)

30129. Westinghouse Electric International Co.—Processes for producing transistors. 21st October, 1955. (799293.)

30396. Plessey Co., Ltd.—Scanning coil assemblies. 19th October, 1956. (799167.)

31129. Mullard Radio Valve Co., Ltd.—Electric gating and like circuits employing transistors. 30th August, 1956. (799189.)

32035. Cheng, W. G.—Electric torches. 9th November, 1955. (799499.)

33892. Zellweger, Ltd.—Receiver devices for remote control installations. 25th November, 1955. (799406.)

34040. British Electrical & Allied Industries Research Association.—Electric secondary batteries. 27th November, 1956. (799308.)

34692. United Kingdom Atomic Energy Authority.—Nuclear reactors. 3rd December, 1956. (799212.)

35929. Crompton Parkinson, Ltd.—Electric arc welding of studs and similar bodies. 4th December, 1956. (799336.)

36144. Marconi's Wireless Telegraph Co., Ltd.—Frequency selective coupling devices for use on high radio frequencies. 7th September, 1956. (799168.)

1956

1030. National Research Council.—Capacitive switches. 11th January, 1956. (799312.)

1171. Siemens-Schuckertwerke Akt.-Ges.—Stage lighting control apparatus. 12th January, 1956. (799407.)

1535. Probert, G. N. G.—Static electricity discharger for vehicles. 12th October, 1956. (799408.)

3790. Western Electric Co., Inc.—Pulse code recognition circuits. 7th February, 1956. (799360.)

4830. Pressac, Ltd.—Means for ejecting electrical fuses from fuse-holders. 15th February, 1957. (799362.)

6345. General Electric Co., Ltd.—Operating mechanisms for on-load tap-changing arrangements for electric transformers and the like. 28th February, 1957. (799363.)

8352. Telefonaktiebolaget L. M. Ericsson.—Pulse transmission systems. 16th March, 1956. (799150.)

9562. Messen-Jaschin, G.—Apparatus for the electric charging of matter suspended in a gas stream. 27th March, 1956. (799380.)

11041. Cable Makers Properties, Ltd. —Electric communication cables. 8th March, 1957. (Addition to 758815.) (799417.)

12917. General Electric Co., Ltd., and Moore, R. C.—Methods of joining metal components. 25th April, 1957. (799419.)

14880. Allmanna Svenska Elektriska Aktiebolaget.—Phase-sequence filter. 14th May, 1956. (799369.)

15497. Ward & Goldstone, Ltd., and Holt, H.—Electric two-part couplings. 3rd May, 1957. (799370.)

16251. Standard Telephones & Cables, Ltd.—Microwave switch. 25th May, 1956. (799448.)

16429. Standard Telephones & Cables, Ltd.—Electron discharge devices. 28th May, 1956. (799236.)

16474. Compagnie Générale de Télégraphie sans Fil.—Backward wave travelling wave tubes. 28th May, 1956. (799323.)

16736. Cheng, W. G.—Electric torches. 30th May, 1956. (799500.)

18943 and 19405. Western Electric Co., Inc.—Transposed electrical conductors. 19th and 22nd June, 1956. (799452/3.)

19785. Bendix Aviation Corporation.—Rotatable inductive electro-mecha ical apparatus. 26th June, 1956. (799382.)

21723. Fichtel & Sachs Akt.-Ges.—Electrical starting arrangements for motor vehicle engines. 13th July, 1956. (799454.)

22005. Mullard Radio Valve Co., Ltd.—Invertor circuits employing transistors. 16th July, 1956. (799154.)

23022. General Electric Co.—Laminated cores for electrical apparatus. 25th July, 1956. (799250.)

28142. Standard Telephones & Cables, Ltd.—Arrangements for locating defective regenerative repeaters in electric pulse systems employing pulses of constant amplitude. 14th September, 1956. (799461.)

29077. Standard Telephones & Cables, Ltd.—Unidirectional waveguide attenuator. 24th September, 1956. (799172.)

29158. General Dynamics Corporation.—Automatic telephone systems. 24th September, 1956. (799481.)

31075. Denford, G. H.—Electromotors. 30th January, 1957. (799464.)

31587. Radio Materials Corporation.—Moulding apparatus for use in making electric condensers. 23rd February, 1955. (799261.)

31588. Radio Materials Corporation.—Apparatus for centring parts of electric condensers preparatory to moulding plastic sheaths on the condensers. 23rd February, 1955. (Divided out of 799260.) (799262.)

32253. Aero Materiel Aktiebolag.—Control system for constant frequency induction alternator. 23rd October, 1956. (799466.)

35241. Allmanna Svenska Elektriska Aktiebolaget.—Electric plug and socket connectors. 19th November, 1956. (799317.)

35603. Aktiebolaget Tudor.—Vent plug for electric accumulators. 21st November, 1956. (799217.)

35687. Union Carbide Corporation, formerly Union Carbide & Carbon Corporation. —Electric dry cells. 22nd November, 1956. (799469.)

37358. General Electric Co.—Self-starting synchronous electric motors. 6th December, 1956. (799473.)

38755. General Electric Co.—Washing apparatus such as for clothes and dishes. 19th December, 1956. (799387.)

1957

5109. Hoover, Ltd.—Steam irons. 14th February, 1957. (799388.)

Market Research in Europe

Two leading British and international advertising agents, S. H. Benson, Ltd., and Coleman Prentis & Varley, Ltd., have joined with the Swiss research company, Analyses Economiques et Sociales (A.E.S.), of Lausanne, to create a marketing and research organisation covering all European markets. The new organisation, Analytical European Surveys, Ltd., will have its headquarters in Switzerland and a London office at 74a, Regent Street, London, W.1.

A.E.S. Lausanne already provide marketing information based on the statistical analysis of field interviews to many important Swiss manufacturers, and these operations are being extended to other countries. In addition, modern analytical techniques —made commercially possible by the advent of computers—are applied to the vast amount of statistical data continually being produced in all countries to provide the necessary background for individual manufacturing, marketing or investment decisions.

The London office will bring the services of the new organisation within reach of English-speaking manufacturers and make available to the organisation the services of distinguished British specialists. These include Professor Richard Stone, Leak Professor of finance and accounting, Cambridge University; Professor Maurice Kendall, professor of statistics at London University; and Dr. Robert Andry, a senior clinical psychologist at several hospitals.

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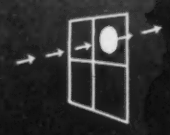

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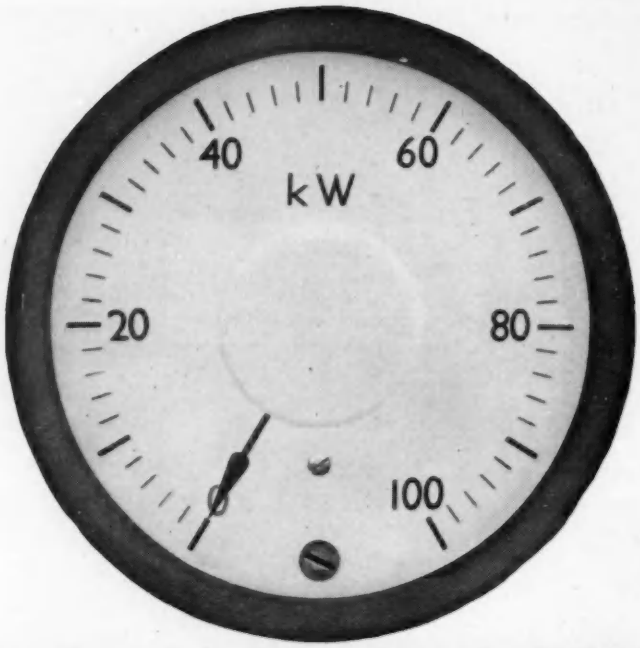

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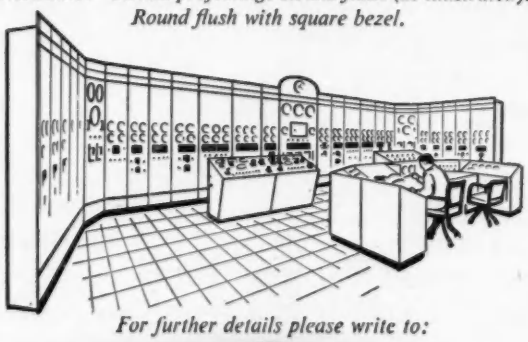

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Victorian Railways, Melbourne. 13th August. Two 100 kW rectifier units. (E.S.B. 19149/58. Ten/33778.)*

Postmaster General's Department, Melbourne. 9th September. Transmitter and parts. (E.S.B. 18694/58. Ten/33730.)*

Burma.—Burma Purchase Board, Rangoon. 14th August. Electric motors, batten holders, ceiling and table electric fans, electric bell pushes and transformers. (E.S.B. 19086/58. Ten/33775.)* Fans, lamp fittings and telephone accessories. (E.S.B. 19085/58. Ten/33774.)*

Cleethorpes.—Corporation. 1st October. Electrical installations in houses on Beacon Hill housing site. (See this issue.)

Desborough.—U.D.C. 1st September. Trunk road lighting equipment. (See this issue.)

Formosa.—Central Trust of China, Taipei. 29th August. Telephone apparatus, cables and wires. (E.S.B. 19070/58.I.C.A. Ten/33822.)*

Greece. — State Procurement Service, Athens. 12th August. 15 kW portable diesel power plant. (E.S.B. 19119/58. Ten/33808.)* 19th August. Transformers. (E.S.B 19231/58. Ten/33810.)* 14th August. Dry cells for transmitter/receiver sets. (E.S.B. 19106/58. Ten/33797.)*

India.—Director General of Supplies and Disposals, New Delhi. 13th August. Cells. (E.S.B. 18949/58. Ten/33771.)*

Korea.—Government Office of Supply, Seoul. 13th August. Telephone cables and equipment. (E.S.B. 18778/58.I.C.A. Ten/33758.)*

Longbenton.—U.D.C. 4th September. Street lighting equipment. (See this issue.)

Manchester.—City Council. Electric lamps. (See this issue.)

New Zealand.—Director-General (Stores Division), G.P.O., Wellington. 19th August. Insulated wire. (E.S.B. 18892/58. Ten/33753.)* 17th September. Diesel engine power plants. (E.S.B. 18893/58. Ten/33752.)* 12th September. 8,000 yd 7/.036 single-core v.i.r., p.v.c. or polythene insulated cable. (E.S.B. 19220/58. Ten/33829.)*

Salvador.—La Proveeduria General de la Republica, San Salvador. 13th August. 150 portable electric cookers. (E.S.B. 19214/58. Ten/33811.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 20th August. Electric lamps. (E.S.B. 19161/58. Ten/33786.)* Diesel-driven power plant. (E.S.B. 19163/58. Ten/33787.)* Insulated cable. (E.S.B. 19162/58. Ten/33788.)*

Union Tender and Supplies Board, Pretoria. 21st August. Radio components and spares. (E.S.B. 19175/58. Ten/33793.)*

Windhoek Municipality. 23rd September. 11 kV switchgear and accessories. (E.S.B. 19235/58. Ten/33828.)*

Pretoria City Council. 9th September. Condensing and feed-heating plant for Rooiwal power station. (E.S.B. 19039/58. Ten/33832.)*

Stamford.—Corporation. 1st September. Street lighting equipment. (See this issue.)

Thailand.—Thai Technical and Economic Committee, Bangkok. 15th September. Power and distribution transformers and step voltage regulator. (E.S.B. 19031/58. Ten/33770.)*

United States.—Department of Interior, Bureau of Reclamation, Denver. 19th August. Two generator voltage switchgear assemblies. (E.S.B. 19109/58. Ten/33789.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aberdeenshire. — Additions to Ellon Academy (£108,774); county architect, 25, Union Terrace, Aberdeen.

Ashington.—Three-storey ward block, Ashington General Hospital, for Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne; P. H. Knighton, Board's chief architect.

Houses (300), Sixth Row; U.D.C. surveyor.

Axminster.—County primary school at Stoney Lane (£54,000); county architect, 97, Heavitree Road, Exeter.

Barnard Castle.—Houses (40) in the Bridgegate area for North-Eastern Housing Association; P. L. Browne, Son and Harding, architects, Pearl Buildings, Newcastle-on-Tyne.

Birmingham.—Chemistry block for University; Barlow, Leslie & Coombs, electrical consultants, 5, Catherine Place, London, S.W.1.

Blaydon-on-Tyne.—Factory for Consett Iron Co.; Alston Limestone Co., Ltd., contractors, Westgate Road, Newcastle-on-Tyne.

Bognor Regis.—Old people's flats (50), Pevensey Road; surveyor, U.D.C. Offices.

Boston.—Sewage works and five pumping stations, for R.D.C.; Stimpson & Rollston, Ltd., contractors, West Avenue, Wigston, Leicester.

Broomhill (Northumberland). — Shop premises for the Broomhill Equitable Industrial Society (£10,000); direct labour.

Cambridgeshire.—Village college, Cottenham; new primary school at Burwell; county architect, Shire Hall, Castle Hill, Cambridge.

Carlisle.—Houses (44) at Cumwhinton Road; Border Engineering Contractors, Ltd., builders, Queen Street, Whitehaven.

Houses (38) at Moor Park Avenue; A. S. Nixon, Ltd., builders, Lowther Street.

New civic centre for the City Council (£600,000); Smith, Seymour and Rooley, electrical consultants, 102, Talbot Road, Manchester.

Cheltenham.—51 houses, 12 flats and eight bungalows, Pecked Lane, Bishop's Cleeve; three bungalows at Winchcombe; Rainger, Rogers and Smithson, architects, Glenmore Lodge, Wellington Square.

Cheriton.—Junior school at Biggins Wood (£64,692); E. T. Ashley Smith, county architect, Springfield, Maidstone.

Depwade.—New council offices at Long Stratton; surveyor, R.D.C., Pulham Market, Diss.

Dover.—Houses (41), area off Durban Crescent; borough engineer, Brook House.

Durham.—Infants' school at Ryton for the C.C.; county architect, South Street.

Eaglescliffe (Co. Durham). — Premises (75,000 sq ft) for the making of concrete units for Dowsett Engineering Construction, Ltd., Tallington, Stamford.

East Barnet.—Houses (74), Bevan estate; surveyor, Town Hall, Station Road.

Edinburgh.—Houses (308), Drum Brae North; A. Steele, city architect, City Chambers, High Street.

Eton.—Houses (46), Dropmore Road, North Burnham; houses (28), Vine Road, Stoke Poges; G. L. Bridger, clerk, Council Offices, Windsor Road, Slough.

Exeter.—First phase of new central technical college (£138,800); A. B. Rowe, city architect, Municipal Offices.

Gateshead.—Factory offices and workshops, Albany Road, for Ridley Engineering Co., Bensham Road.

Grammar school at Heathfield for the E.C.; G. F. Winters, borough engineer.

Gloucester.—Ice cream depot for T. Wall & Sons, Ltd.; J. Stanley Beard, Bennett & Wilkins, architects, 101, Baker Street, W.1.

Grantham.—Factory and offices, Harlaxton Road; Melwood Thermoplastics, Ltd., Willoughby Road, Harpenden.

Guisborough.—Houses (56) for the U.D.C.; A. T. Pallister, surveyor.

Harrogate.—Secondary technical school; West Riding county architect, Bishopgarth, Westfield Road, Wakefield.

Hereford.—Extensions for Painter Bros., Mortimer Road; W. S. Atkins & Partners, consulting engineers, 158, Victoria Street, London, S.W.1.

Hove.—Flats (48), Hangleton Park; borough engineer.

Ince-in-Makerfield.—Houses (80), Whalley's Basin site; surveyor, Town Hall, Ince, near Wigan.

Kempston.—Secondary school; Geo. Dawson & Son, Ltd., builders, Castle House, Linslade, Leighton Buzzard.

Kingston-on-Thames.—Outpatients' department for General Hospital; Gordon Jeeves, architect, 61, Catherine Place, London, S.W.1.

Leamington Spa.—Dwellings (57), Lillington estate; Rayner & Fedeski, architects, 28, The Parade.

Leicester.—Six-storey building as first instalment of scheme for new civic centre (£280,000); J. Lloyd Owen, city architect, 7, Newarke Street.

Works extensions, Cambridge Road, for English Electric Co., Ltd.; James Miller & Partners, Ltd., New Millerdam, Wakefield.

New county library for Leics. C.C. (£30,500); county architect.

Leytonstone.—Extensions (£62,500), Langthorne Hospital; regional architect, 3, Queen Anne Street, London, W.1.

Maidenhead.—Municipal offices; North & Partners, architects, 40, Broadway.

Manchester.—Erection of maintenance depot at Cotefield Road, Wythenshawe; city architect, P.O. Box 488, Town Hall.

Monmouth.—Redevelopment of Haberdashers Jones Boys' School, Weirhead Street; Gardiner & Theobald, quantity surveyors, 49, Bedford Square, London, W.C.1.

Morden.—Baptist church; A. J. Wait & Co., Ltd., builders, Wellington Crescent, New Malden.

Newcastle-on-Tyne. — Operating theatre suites at Prudhoe and Monkton Hospital, Newcastle General Hospital, Sunderland General Hospital, and Middlesbrough Maternity Hospital; Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne.

Factory extension, St. Mary's Street; Hedley & Co., Ltd., City Road.

Block of shops and offices, Princess Street, for J. T. Bell and Sons, builders, Market Street.

Flats (141) on the Newbiggin Hall estate for the City Council; William Leech, Ltd., builders, St. James Street.

Newton Aycliffe.—Houses (136) and blocks of maisonnettes for Aycliffe Development

Corporation; M. C. Robson and Son, architects, Station Chambers, Bishop Auckland.

Northampton.—Shopping arcade in town centre; Beattie, Son & Leslie, Market Square.

North Riding.—Secondary modern schools at Saltburn, Whitby, Eston and Redcar, grammar-technical school at Redcar, junior school at Marske, and primary school at Marton; county school architect, County Hall, Northallerton, Yorkshire.

North Shields.—Wagon repair and platers' shops, Albert Edward Dock, for the Tyne Improvement Commission; William Bain & Co., Ltd., builders, Coatbridge, Scotland.

Northumberland. — Secondary modern school at Seahouses for the C.C.; county architect, County Hall, Newcastle-on-Tyne.

Norwich.—City engineer's depot at Mile Cross Road (£89,700); D. Percival, city architect.

Nottingham.—Civic theatre, East Circus Street; Peter Moro, architect, 32, Crooms Hill, London, S.E.10.

Oldbury.—Secondary technical school; L. C. Lomas, architect, 14, Castle Street, Worcester.

Otley.—Block of six shops, with living accommodation over, Weston Lane estate; surveyor, North Parade.

Oxford.—Office block, New Road; G. R. Hutton, architect, Park End Street.

Medical and nursing staff accommodation, Littlemoor Hospital; Oxford Regional Hospital Board architect, 43, Banbury Road.

Poole.—Second instalment of technical college (£250,000); county architect, County Hall, Dorchester.

Reading.—Dwellings (69), Blagden Road; borough architect.

Showrooms and offices, Friar Street; Prudential Assurance Co., Ltd., Holborn Bars, London, E.C.1.

Redcar.—Houses on 385 acres of land; K. W. Ash, borough engineer.

Rickmansworth.—Houses (68), Maple Cross estate; C. G. Ransome Williams, clerk, Council Offices.

Sandown. — Grammar-technical school; county architect, County Hall, Newport, Isle of Wight.

Houses (50), Green Lane; Shannon Contractors, Ltd., Stockton Road, Middlesbrough.

Electrical work at 109 new houses at Hardwick for the T.C.; borough architect, 28, The Square.

Southampton.—Science laboratory for Portswood Secondary School; M. D. Little, architect, 17, College Place.

Southsea.—Winter garden (£200,000); J. Parkin, city engineer, 1, Clarence Parade.

Sunderland.—Houses (124) on various sites for the T.C.; H. C. Bishop, borough architect, Grange House, Stockton Road.

Houses (62) in Corporation Road for the T.C.; L. W. Evans, Ltd., builders, 18, Norfolk Street.

Blocks of shops and flats, Farringdon and Hylton Red House estates; H. C. Bishop, borough architect, Grange House, Stockton Road.

Houses (298), Grindon Village estate; L. W. Evans, Ltd., builders, 18, Norfolk Street.

Swansea. — Factory, Kingsway trading estate; Dan Hansen, Ltd., 280, Neath Road, Landore.

Blaen y Maes Primary School; Gee, Walker & Slater, Ltd., builders, Coity Road, Bridgend.

Taunton.—Ladymead Secondary Modern School; R. O. Harris, county architect, Park Street.

Thornaby-on-Tees. — Houses (£37,846); Selleck, Nicholls & Co., Ltd., contractors, Derby.

Wakefield.—Garage and showrooms for Comberhill Motors, Ltd., Ings Road; Harry Webster, architect, 6, Vernon Street, Leeds.

West Lothian.—Primary school at Armadale; J. Calder, county clerk, County Buildings, Linlithgow.

Windsor.—Clewer Manor Junior School; Francis Bros., Ltd., builders, Tilehurst, Reading.

Danish Electrical Trade, 1957

Although Denmark is primarily an agricultural country, she has a highly developed electrical industry which has been established for a considerable time. Local production was encouraged during the second world war and has subsequently been protected by import restrictions, imposed mainly for balance-of-payments reasons, and by the need for certain electrical products to conform to local marketing regulations and specifications.

Table I.—Denmark's Electrical Imports and Exports, 1957. By Countries (000 kr)

Countries	Imports	Exports
United Kingdom	38,111	11,686
Western Germany	75,665	18,221
East Germany	1,098	269
Norway	2,357	25,268
Sweden	37,437	37,874
Holland	37,898	23,577
Iceland	2	2,451
Finland	75	9,774
Belgium/Luxembourg	1,149	6,551
France	2,518	6,021
Italy	1,853	6,126
Switzerland	10,097	7,700
Austria	589	1,770
Hungary	1,363	611
Russia	—	3,103
Poland	—	3,414
Portugal	—	1,412
Spain	—	2,457
Czechoslovakia	468	2,817
Greece	—	2,747
United States	18,251	5,582
Canada	129	1,772
Brazil	—	14,397
Argentina	—	2,700
Chile	—	1,575
Peru	—	832
Colombia	—	1,231
Venezuela	—	1,096
Egypt	—	1,741
French West Africa	—	2,310
South Africa	—	2,242
Israel	—	1,070
India	—	4,783
Indonesia	—	932
Japan	—	1,039
Korea	—	1,081
Australia	—	2,829
New Zealand	—	2,119

Denmark's production of electrical machinery and apparatus is steadily increasing, but her exports fell slightly from £12·8 million in 1956 to £12·3 million last year. Imports increased during the same period from £10·2 million to £11·8 million. As can be seen from Table 1, Western Germany was Denmark's main supplier last year, followed by the United Kingdom, whose exports remained at the same level as in 1956.

Denmark's electrical exports, though small in total, went to nearly all world markets. Sweden, Norway, Holland and Western Germany were her principal customers in Europe, and Brazil the main market overseas. (£1=19·4 kr.)

Table II.—Denmark's Electrical Imports and Exports, 1957, by Product Groups (000 kr)

Product Group	Imports	Exports
Motors, generators and convertors	35,759	40,936
Batteries	1,691	13,237
Lamps	10,487	492
Radio transmitters and navigation aids	17,616	9,070
Radio receivers	2,765	5,718
Radio valves	6,591	95
TV tubes	10,357	—
X-ray tubes	1,512	139
X-ray and electro-medical apparatus	5,299	6,921
Radio components, n.e.s.	16,212	23,839
Telephone and telegraph apparatus	32,163	4,464
Heating appliances	8,491	3,947
Electrical equipment for vehicles	9,950	666
Control and regulating and signalling equipment	12,571	19,645
Domestic appliances	8,372	14,560
Cables	5,231	14,106
Miscellaneous electrical equipment and apparatus, n e.s.	44,089	82,998

Forthcoming Events

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Thursday, 17th July, to Thursday, 27th September

CARDIFF.—Cardiff Castle. *Daily Telegraph* "Son et Lumière."

Thursday, 31st July, to Saturday, 11th October

GREENWICH.—*Daily Telegraph* "Son et Lumière."

Tuesday, 26th August

BIRKENHEAD.—Prenton Golf Course. Electrical Industries Golf Championship, Merseyside and North Wales Area Competition.

Wednesday, 27th August, to Wednesday, 3rd September

GLASGOW.—British Association for the Advancement of Science. Annual meeting.

Wednesday, 27th August, to Saturday, 6th September

LONDON.—Earls Court. National Radio and Television Exhibition.

Tuesday, 2nd September, to Thursday, 11th September

LONDON.—Olympia. Domestic Equipment Trades Fair.

Tuesday, 16th September, to Friday, 19th September

HARROGATE.—Association of Public Lighting Engineers. Annual conference.

Monday, 22nd September, to Saturday, 27th September

MANCHESTER.—City Hall. National Business Efficiency Exhibition.

Tuesday, 23rd September

LONDON.—Caxton Hall. A.S.E.E. Electrical Engineers Exhibition. Ballot meeting.

Wednesday, 24th September, to Friday, 3rd October

LONDON.—Olympia. Industrial Fuel Efficiency Exhibition.

Thursday, 25th September

LONDON.—Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker Mr. W. Laver.

Friday, 26th September, to Saturday, 4th October

LONDON.—Earls Court. Commercial Motor Show.

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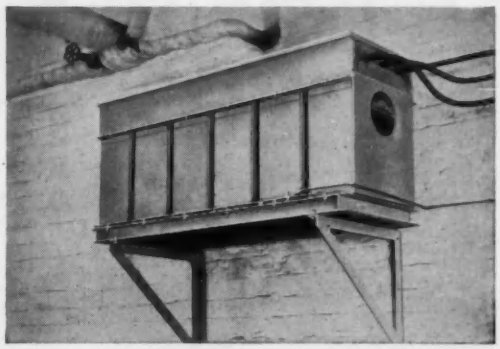

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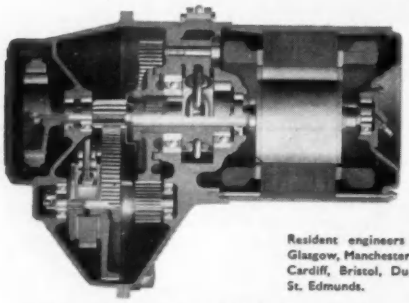

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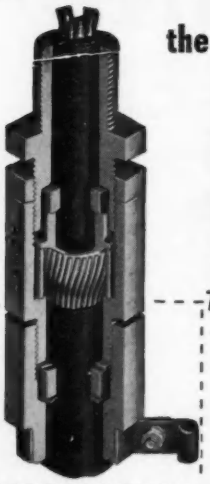

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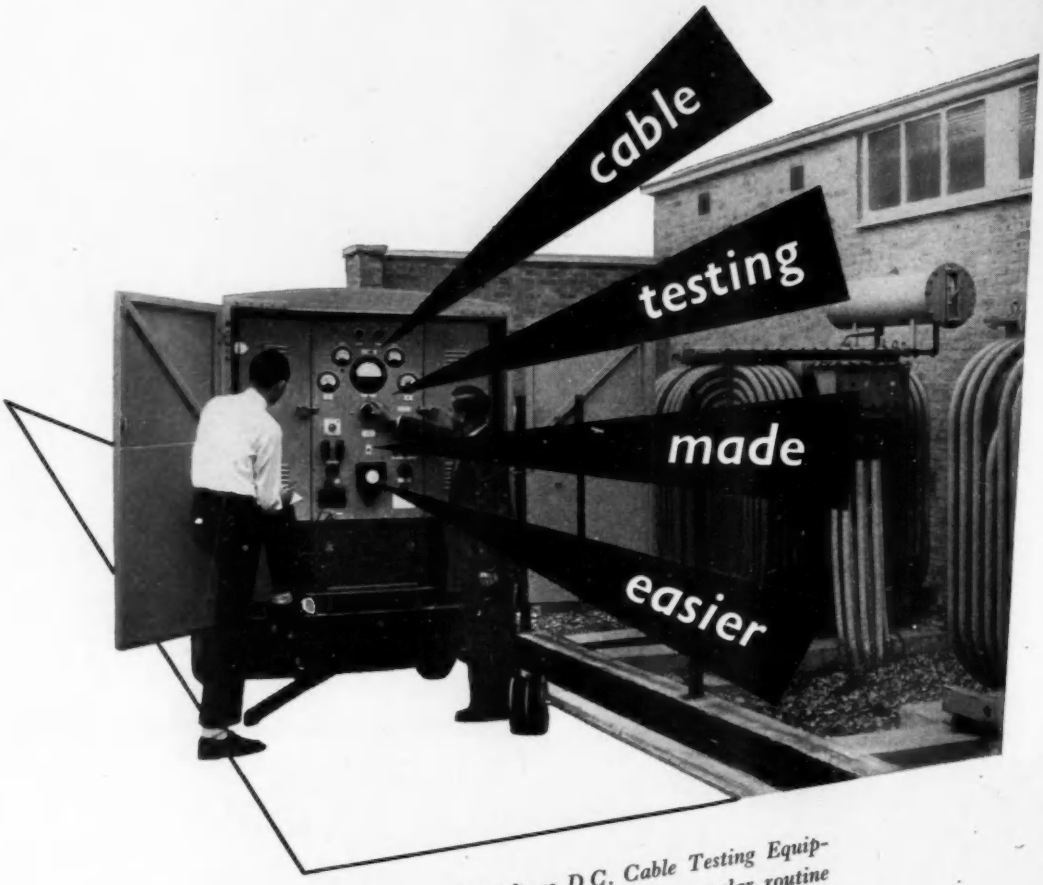

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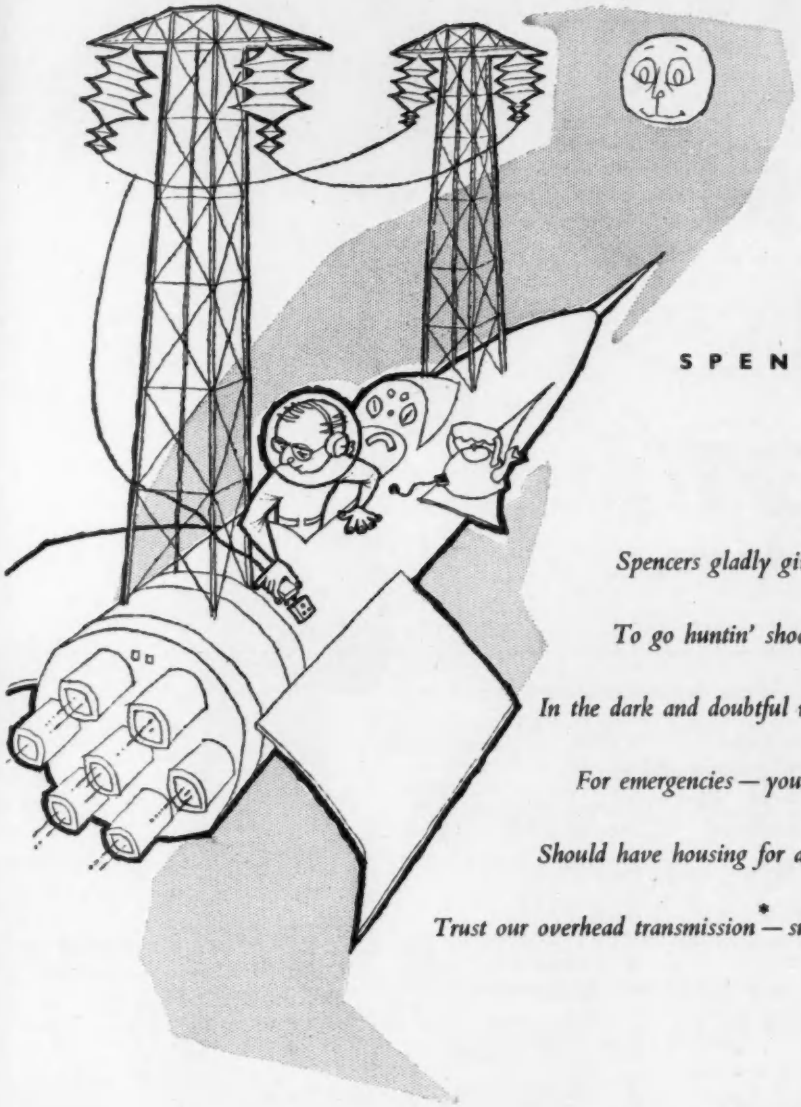

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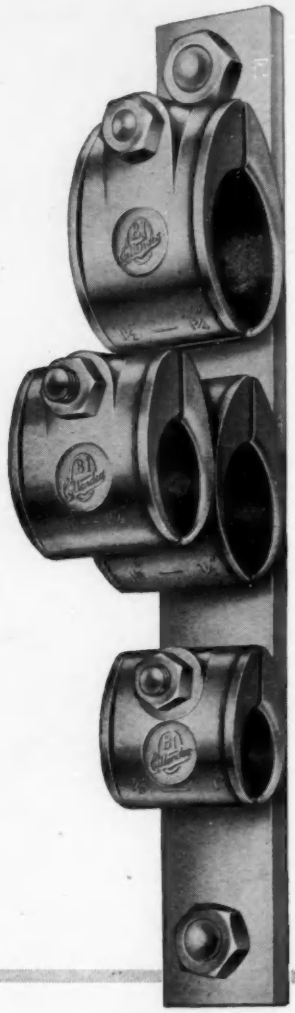

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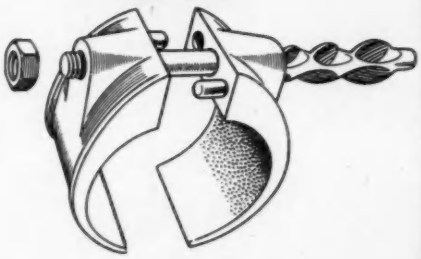

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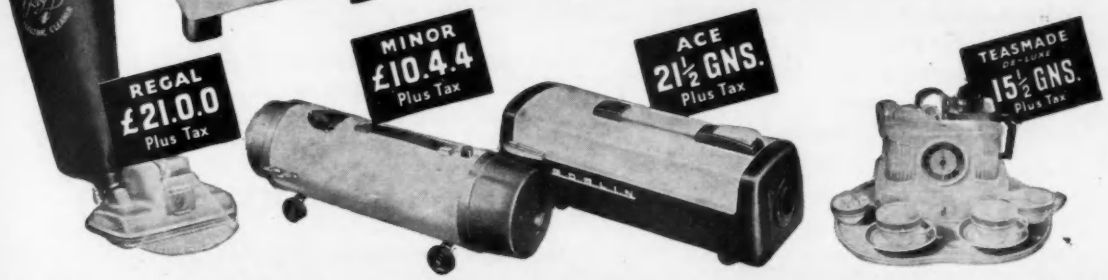

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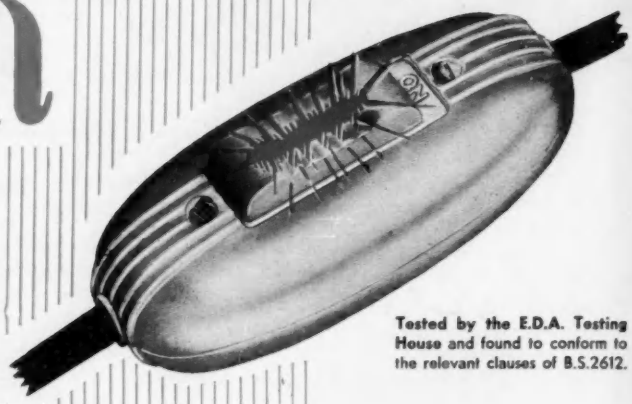

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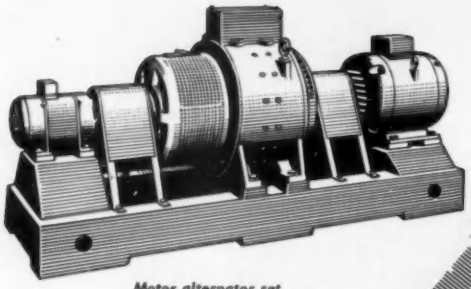

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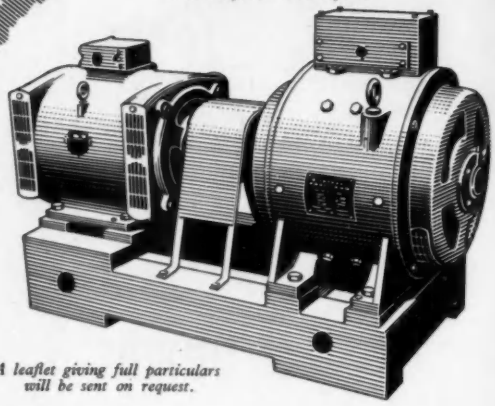

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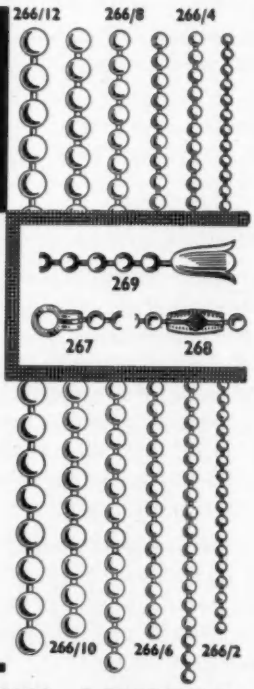

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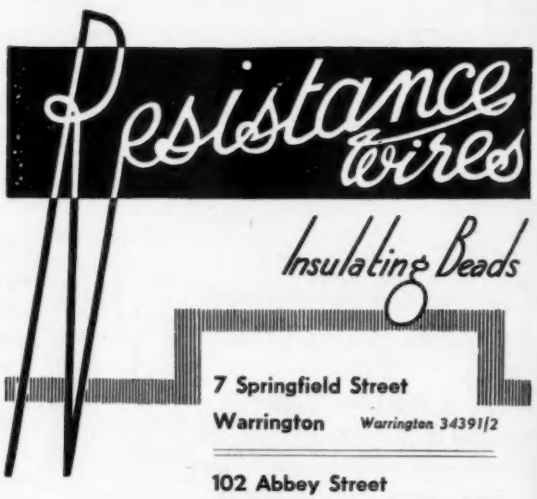

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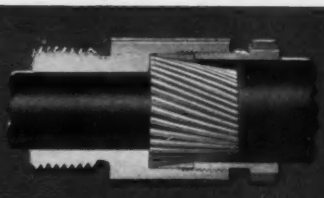

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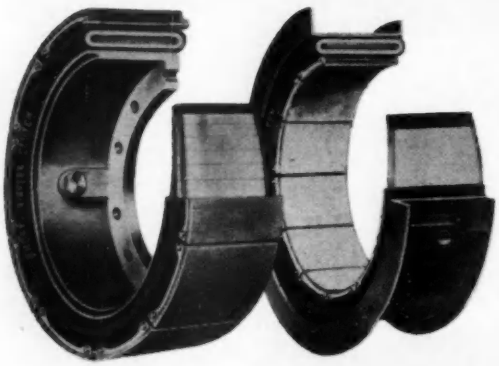

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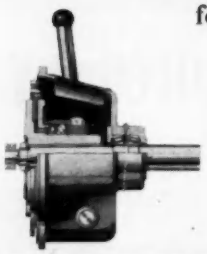

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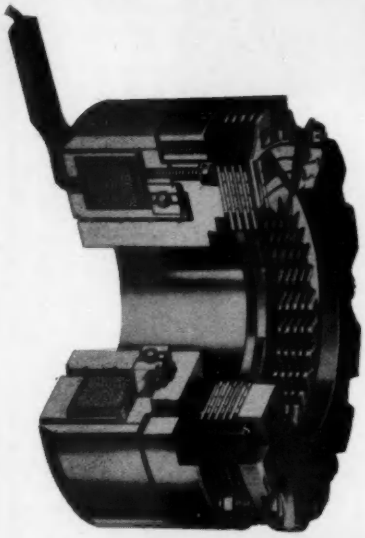

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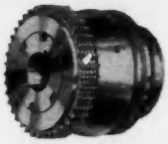

BOM-L Multiple Disc Clutch
Publication
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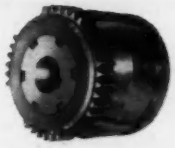

Patent RM Multiple Disc Clutch
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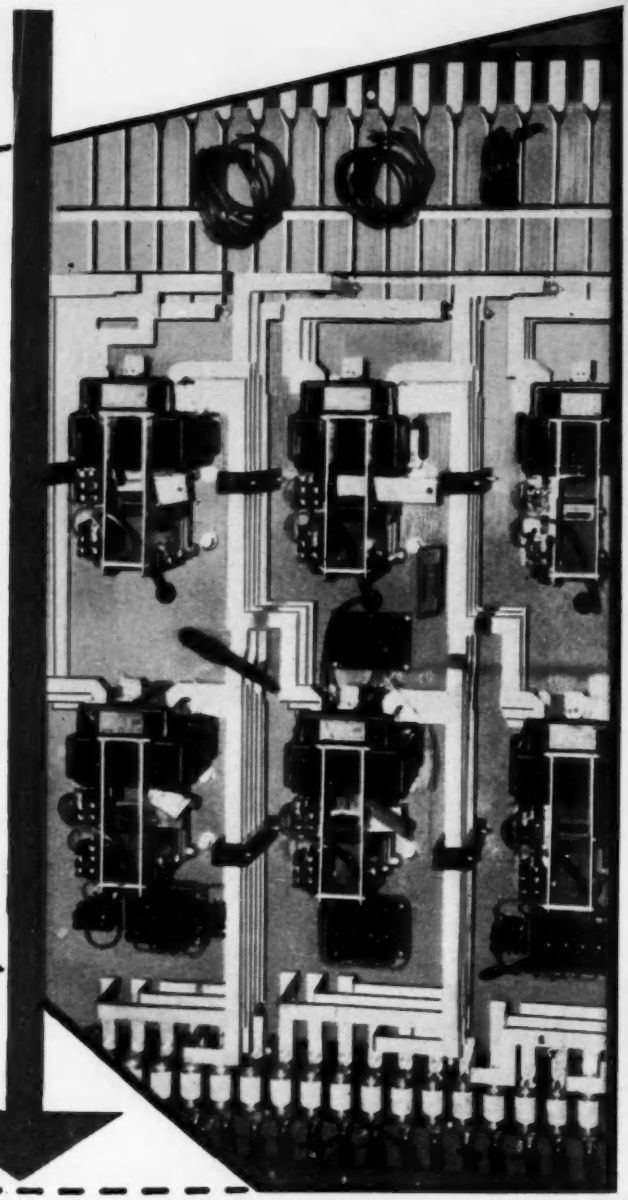

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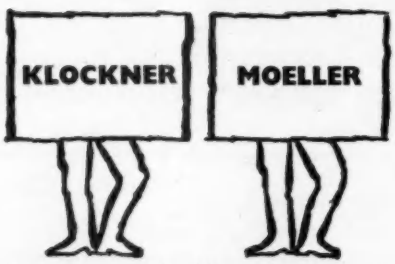

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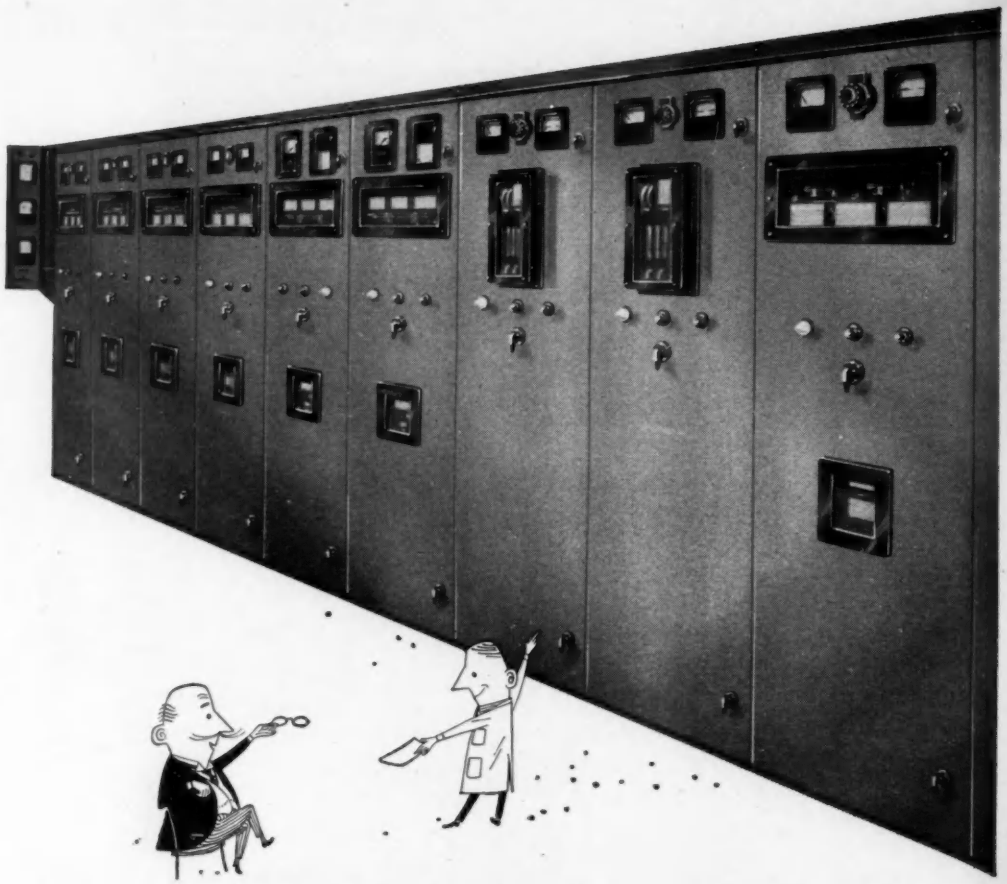

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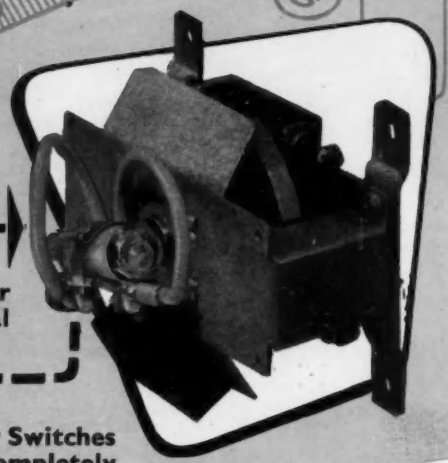

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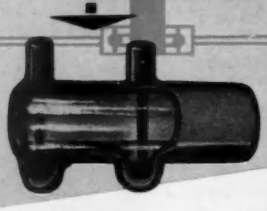

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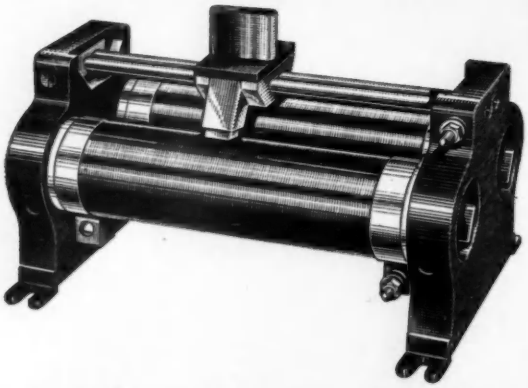

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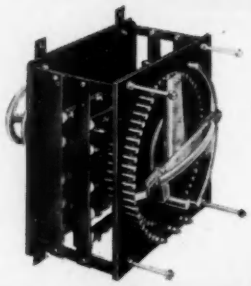

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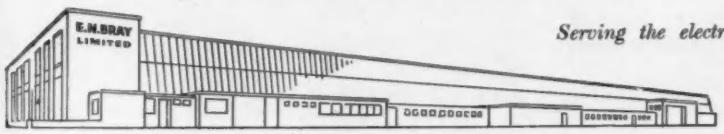

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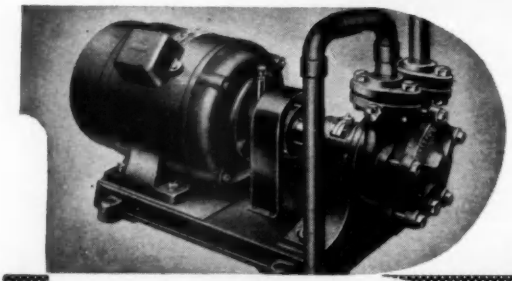

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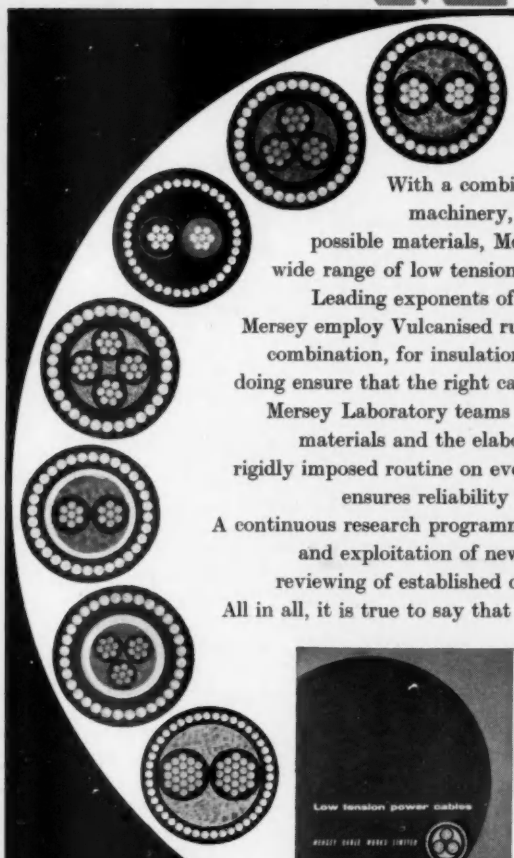

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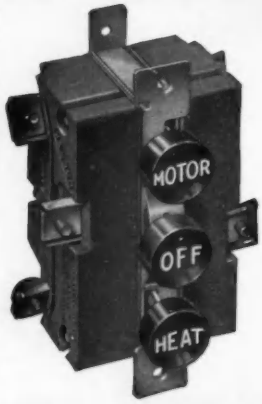

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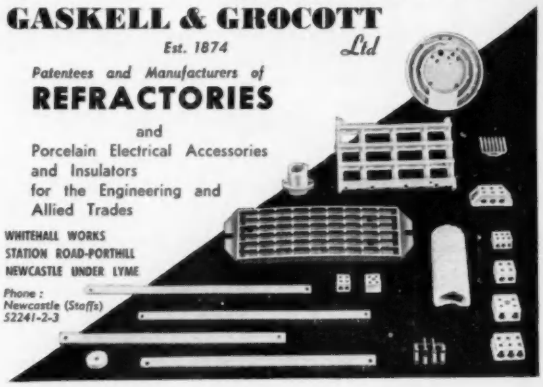

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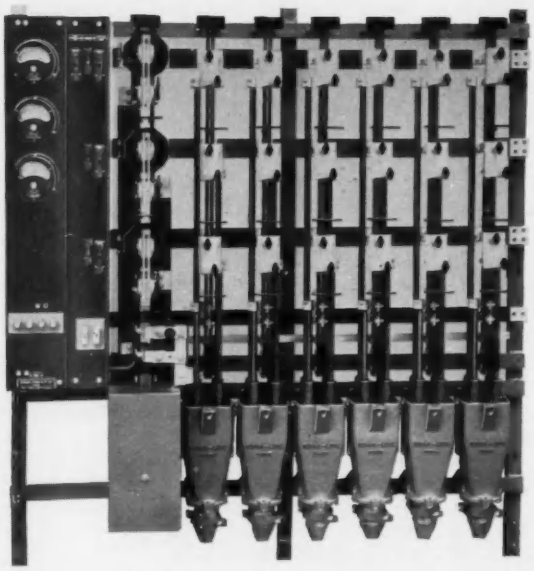

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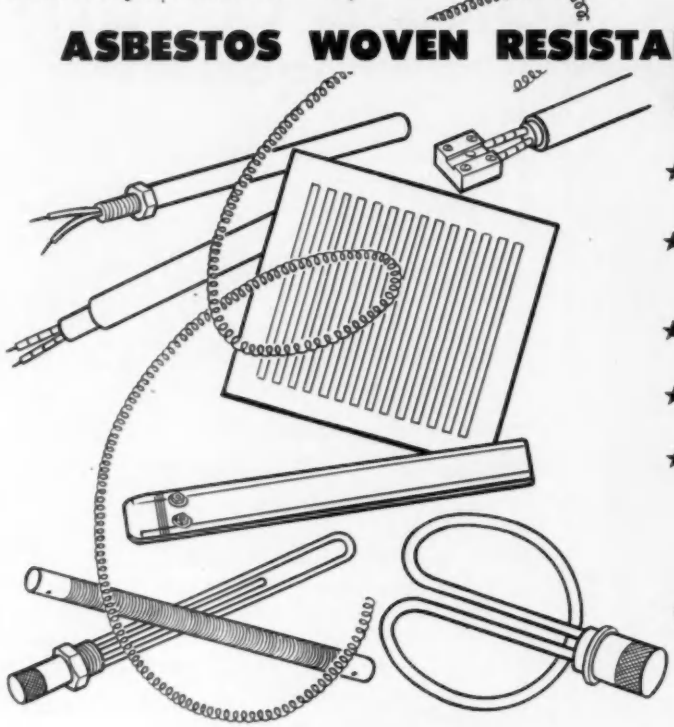

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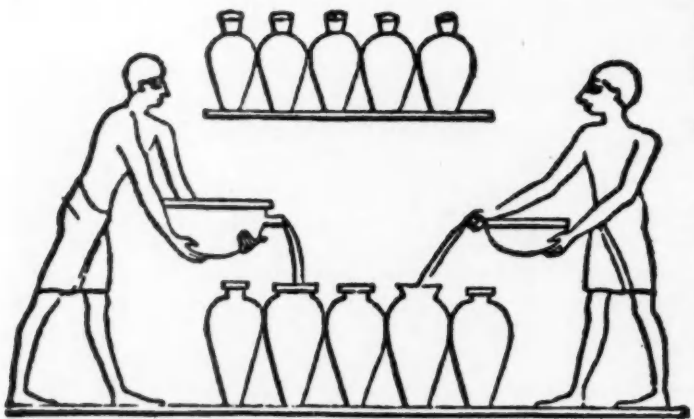

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We are especially practised in:

★ **High Capacity Lubrication Systems**
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The storage, movement and measurement of liquids have tested the ingenuity of man since history began. But the decorative devices of earlier civilizations are no answer to the complex problems of the new technologies (like the refining of crude oil and the chemistry of its many by-products) which have brought a fresh urgency to this age-old problem. All the very latest techniques and developments in this essential field have been collected and collated by Liquid Systems Ltd. in a unique service to industry—from Drawing Board to finished installation.

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FOUR TYPES OF
WESTINGHOUSE
RECTIFIERS
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600 kW SILICON
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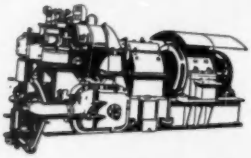
BROTHERHOOD

GENERATING SETS



Turbine driven up to 11,000 kW. Engine driven up to 340 kW.

Scores in hand, hundreds in service.

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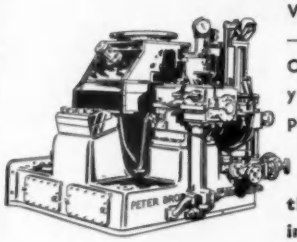
FOR DRIVING PUMPS, ETC.



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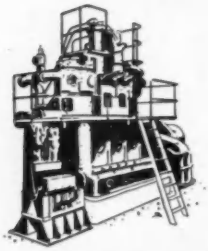

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PETER BROTHERHOOD
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COMPRESSOR & POWER PLANT SPECIALISTS FOR NEARLY A CENTURY

P.1558

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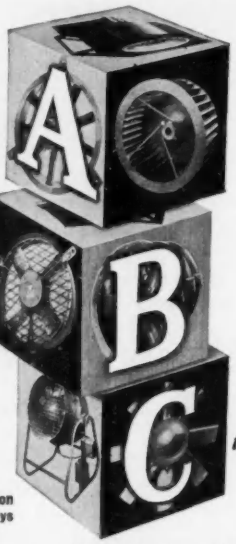

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Airscrew can provide the right fan at the right time from their Standard range of Axial Flow and Centrifugal Fans. The Airscrew Technical Service is ready to assist in fan selection from the Standard ranges or by special design when required.
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For high and low voltage testing, Standard Model: range 100/850 volts A.C. or D.C. Dual Model: range 1/30 and 100/850 volts A.C. or D.C. Send for leaflet 25F. 16-page booklet "Hints on Electrical Testing" now available — 1/- post free.

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INDUSTRIAL FLUORESCENT FITTINGS

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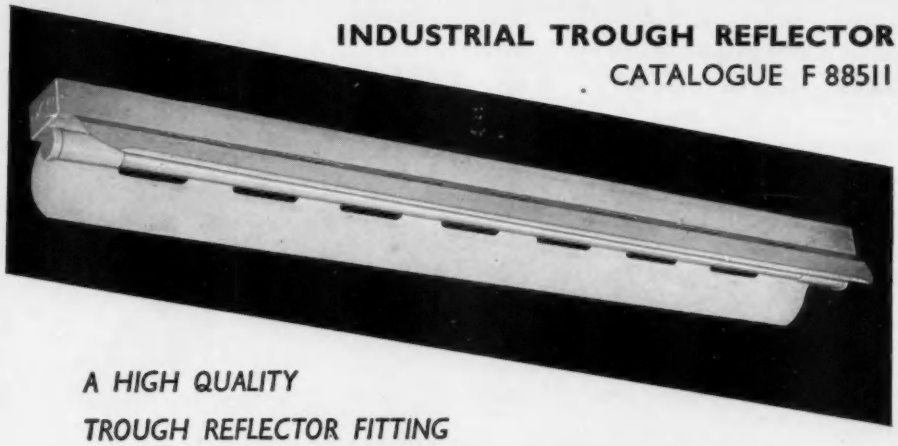

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FOR 5 ft AND 4 ft FLUORESCENT LAMPS

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			£ s d	£ s d	£ s d
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36 Grosvenor Gardens, Westminster, S.W.1
Telephone: SLOane 0121
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23 Lansdowne Road, Purley, Surrey
Telephone: Uplands 4818, 4819 & 4810
Complete electrical installations. Rewinding and repair of motors and transformers. Manufacturers of control gear for fluorescent.

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C. A. J. BILLINGTON LTD.
Cranfield, Bedfordshire
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Industrial Installation throughout the Home Counties

(*Continued on page 106*)

(Continued from page 105)

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Quality House, Temple Row, Birmingham 2
Telephone: CEN. 7611/5
Electrical Installation Engineers. Industrial Installation Specialists
Established 1895

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Telephone 21281-2 *Telegrams: "Whelect"*

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10–3,500 K.V.A.
Estimates free – All work guaranteed. Reconditioned Motors ex stock – Reconditioned Transformers to suit your requirements
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Power for every purpose

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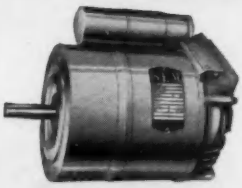
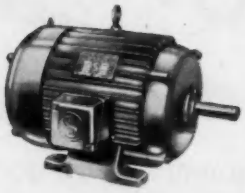


will serve you better



WE have an enthusiastic team of qualified engineers to study your problem.

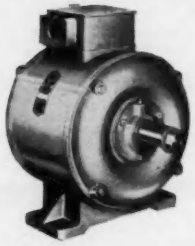
WE have the most modern machine tools and methods for efficient and accurate production.

WE have more than 40 years' experience in the design and manufacture of Electrical Rotating Machinery.

WE offer you a technical service of the highest quality.

WE are keen to tackle your problem, whether it be electrical or Electro-mechanical.

Let us demonstrate what we can do for YOU, and remember S.E.M. is at YOUR service.



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Battery-operated D.C. Traction Motors with associated Control Gear.
Medium and High Frequency Alternators.
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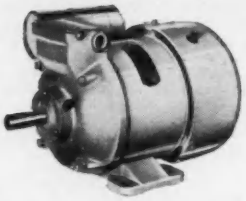

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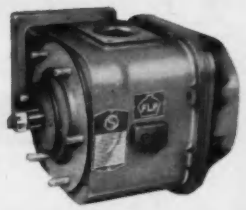

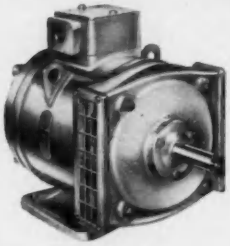

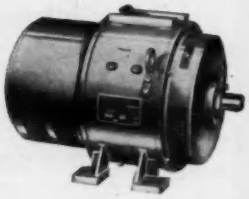

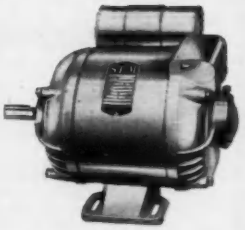

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Works: Eagle Works, Beckenham · St. John's Works, Penge · Laurel Grove Works, Penge

Osram the GUARANTEED Tube

A free replacement will be given for any standard straight Osram tube which fails under normal service conditions before 3,000 hours or one year of use, whichever is the shorter.

This guarantee covers all Osram Tubes from 1½ ft – 8 ft, 15 w – 125 w.

Unique manufacturing processes are used in making Osram guaranteed tubes. These techniques are designed to eliminate early failures and ensure superb maintenance of lighting efficiency throughout a long life.

Osram Guaranteed Tubes for trouble-free lighting

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Original testimonials should not be sent with applications for employment

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Thirty-two Single Bedroom Flats in Two Blocks of Twenty and Twelve at Davenport Drive.

The work will be carried out under a subcontract to the main building contract.

Forms of tender, conditions of contract, specifications and all relevant information may be obtained from A. B. Cooper, A.M.I.C.E., Borough Engineer, Council House, Cleethorpes, where drawings may be inspected.

Applications for particulars must be accompanied by a deposit cheque of two guineas made payable to the Cleethorpes Corporation, which will be returned upon receipt of a bona fide tender.

Tenders in official sealed envelope must reach the undersigned not later than noon on Wednesday, 1st October, 1958.

The Council do not bind themselves to accept the lowest or any tender.

G. SUTCLIFFE,
Town Clerk.

Council House,
Cleethorpes.
5th August, 1958. 4420

COUNTY BOROUGH OF DUDLEY

Street Lighting: Second Year Programme

APPLICATIONS to tender are invited for the above contract which provides for an improved Lighting Installation on various roads within the Borough.

The work consists of the provision and erection of 112 Group "A," 410 Group "B" Stanton prestressed concrete columns, 38 Group "A" tubular steel columns, and 19 wall mounted lighting points with Sodium, Mercury and Fluorescent lamps, together with all necessary lanterns and control gear.

Applications must be submitted to the Borough Engineer, The Council House, Priory Road, Dudley, together with a deposit of £5 5s., which will be returned on receipt of a bona fide tender, not subsequently withdrawn, and the return of all documents.

The latest date for the receipt of applications is Friday, 15th August, 1958, and tender documents will be forwarded as soon as possible after that date.

P. D. WADSWORTH,
Town Clerk.

The Council House,
Dudley, Worcs.
24th July, 1958. 4342

BOROUGH OF STAMFORD

Street Lighting

TENDERS are invited for installing 57 Concrete Columns for Group "B" Street Lighting in various streets within the Borough.

Specification and form of tender may be obtained on application to the Borough Surveyor, Town Hall, Stamford, Lincs., upon payment of a deposit of £2 2s., which is returnable on receipt of a bona fide tender. Tenders, in plain sealed envelopes, endorsed "Tender for Street Lighting," should reach the undersigned not later than 10 a.m. Monday, 1st September, 1958.

The Council do not bind themselves to accept the lowest or any tender.

H. BEDFORD,
Town Clerk.

Town Hall,
Stamford, Lincs.
31st July, 1958. 4395

DESBOROUGH URBAN DISTRICT COUNCIL

Class "A" Street Lighting

London-Carlisle Trunk Road, A.6

TENDERS are invited for the supply and erection of Group "A" lighting as follows:

(a) 59 steel columns with lanterns and auxiliary equipment for 3/80-watt Fluorescent Lanterns;

and as an alternative—

(b) 59 steel columns with lanterns and auxiliary equipment for 400-watt Mercury Vapour Lanterns.

Specification, bills of quantities and form of tender may be obtained from the Surveyor to the Council, Council Offices, Desborough, near Kettering, at whose office a plan of the scheme may be examined during normal business hours.

Tenders with fully priced bills of quantities should be sent in plain sealed envelopes endorsed "Trunk Road Lighting" to the undersigned so as to arrive not later than noon on Monday, 1st September, 1958.

GERALD GREAVES,
Clerk of the Council.

Council Offices,
Desborough,
Nr. Kettering, Northants.
1st August, 1958. 4394

LONGBENTON URBAN DISTRICT COUNCIL

Public Street Lighting
at
Front Street, Annitsford

TENDERS are invited for the supply and erection of 13 Sodium Vapour Street Lighting Units, mounted on concrete columns at Front Street, Annitsford, from Annitsford Roundabout northwards to Wagonway.

Plans can be inspected at the office of the Engineer and Surveyor, and specification, schedule and form of tender can be obtained on application to Mr. A. E. Sweetman, M.I.Mun.E., Engineer and Surveyor, on payment of a deposit of £2 2s. returnable only on receipt of a bona fide tender, not subsequently withdrawn, and the return of all the documents loaned.

Tenders in a plain sealed envelope endorsed "Public Street Lighting," must be delivered to the undersigned by 4th September, 1958.

The Council do not bind themselves to accept the lowest or any tender.

G. HARRISON,
Clerk of the Council.

Council Offices,
Forest Hall,
Newcastle upon Tyne, 12. 4414

CITY OF MANCHESTER

TENDERS are invited for the supply of Electric Lamps.

Tender forms, returnable by 20th August, 1958, from the City Surveyor, Town Hall, Manchester, 2. 4380

CLASSIFIED ADVERTISEMENTS ARE PREPAID

SITUATIONS VACANT

TECHNICAL INSTRUCTORS (ELECTRICAL)

required by

Nigeria Federal Government Education Department

for (a) Yaba Technical Institute, Lagos, for one tour of 9/10 months in first instance (M2C/50172/EF), and (b) Yaba Trade Centre, Lagos, for one tour of 12/24 months in first instance (M2C/50173/EF).

Salary according to qualifications and experience in scale (including inducement addition) £834 rising to £1,386 a year with resettlement grant at rate of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards children's passages and grant up to £150 annually towards maintenance in U.K. Liberal leave on full salary.

Candidates, preferably not less than 25 years of age, must have served a full apprenticeship and be experienced practical tradesmen. Experience of apprentice training and teaching experience an advantage.

Candidates for post (a) should possess Final C. and G. Certificate in Electrical Engineering Practice, which must include in Part II of the Final, Sections B and C — Generation and Transmission, Distribution, etc.—or a C. and G. Electrical Technician's Certificate in Power Generation and Supply. Ability to teach Radio Service Work an advantage.

For post (b) candidates should possess C. and G. Certificates in Electrical Installation Courses B and C, or equivalent.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote the reference number shown against the post applied for. 4365

ENGINEERS—VENEZUELA

TWO MECHANICAL ENGINEERS of minimum age 35 sought for 100,000-kW steam power station in Venezuela. Qualifications required are:—

Higher National Certificate, University Degree or Corporate Membership of Institution of Mechanical Engineers.

At least five years of operating and maintenance experience in a responsible position with a steam generating plant of 50,000 kV or higher.

Salary paid in U.S. dollars will be on a generous scale.

Full details should be forwarded by post and time will be allowed for overseas applications to be received and considered. Write to: Messrs. Mackness & Shipley, Parliament Mansions, Abbey Orchard Street, London, S.W.1. 4400

WATCHMAKERS/ WATCH REPAIRERS

are required to repair small delicate mechanisms in the Instrument Department of a large chemical works.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham

4249

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

ASSISTANT SHIFT CHARGE ENGINEER, CASTLE DONINGTON POWER STATION
(Vacancy No. 120/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class L, Grade 8 (£1,160-£1,235 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for the receipt of applications, 13th August, 1958.

ENGINEERING DRAUGHTSMAN (Civil), CONSTRUCTION DEPARTMENT, NORTH WILFORD POWER STATION
(Vacancy No. 97/58/ER).

Applicants should have experience in design and detail of reinforced concrete structure, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings.

The salary will be in accordance with Grade 6 (£595-£715 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for the receipt of applications, 20th August, 1958.

ASSISTANT SHIFT CHARGE ENGINEER, NORTHAMPTON POWER STATION
(Vacancy No. 121/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class G, Grade 9 (£835-£880 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 20th August, 1958.

THIRD ASSISTANT ENGINEER (Electrical), GENERATION (Construction) DEPT., SPONDON "H" POWER STATION SITE
(Vacancy No. 122/58/ER).

Applicants should have had a fundamental training in electrical engineering, including workshops, and should preferably have had experience in the manufacture, erection and maintenance and operation of electrical plant as installed in modern power stations. Preference will be given to candidates who possess a Degree or are Graduate Members of the Institution of Electrical Engineers.

Salary will be within Class AX/EX, Grade 6 (£895-£1,140 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 13th August, 1958.

ASSISTANT MAINTENANCE ENGINEER (Mechanical), DRAKELOW "A" AND "B" POWER STATIONS
(Vacancy No. 123/58/ER).

Applicants should have received a sound technical training and have wide practical experience in the maintenance of power station mechanical plant.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership. The ultimate combined capacity of these stations will be 720 MW.

Salary will be in accordance with Class L, Grade 8 (£1,160 - £1,235 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th August, 1958.

ASSISTANT MAINTENANCE ENGINEER (Electrical), DRAKELOW "A" AND "B" POWER STATIONS
(Vacancy No. 124/58/ER).

Applicants should have received a sound technical training and have wide practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership. The ultimate combined capacity of these stations will be 720 MW.

Salary will be in accordance with Class L, Grade 8 (£1,160 - £1,235 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th August, 1958.

PLANT SHIFT CONTROL ENGINEERS, DRAKELOW "B" POWER STATION
(Vacancy No. 125/58/ER).

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience. Technical qualifications to Higher National Certificate desirable. The ultimate capacity of this station will be 480 MW.

Salary will be in accordance with Class J, Grade 10 (£885 - £930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 20th August, 1958.

ASSISTANT SHIFT CHARGE ENGINEERS, DRAKELOW "B" POWER STATION
(Vacancy No. 126/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class J, Grade 8 (£995 - £1,055 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 20th August, 1958.

ASSISTANT SHIFT CHARGE ENGINEER, STAYTHORPE POWER STATION
(Vacancy No. 127/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class K, Grade 8 (£1,065 - £1,140 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 20th August, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

Divisional Controller.

25th July, 1958. 4363

THE GENERAL ELECTRIC COMPANY LIMITED

have vacancy for an

OPERATING ENGINEER

for their Power Plant Division based at Erith, Kent.

Duties include the commissioning and operation of turbo-alternator and turbo-blower plant at home and abroad and the site investigation of operating problems.

Applicants must possess initiative and determination, and the post would suit a Shift Charge Engineer in a large central power station. Minimum qualification Higher National Certificate.

Apply giving age and experience to—

Personnel Manager (FLT)
THE GENERAL ELECTRIC COMPANY LIMITED
Erith, Kent

4377

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

APPLICATIONS are invited for the following posts :—

STATION SUPERINTENDENT, OXFORD GENERATING STATION
(S/13.1020).

Applicants should have received a thorough technical and practical training followed by wide experience in the operation and maintenance of generating station plant, and have also held a position of responsibility involving the control of technical and administrative staffs. Preference will be given to corporate members of one of the senior professional engineering institutions, or those holding similar qualifications.

Salary N.J.B. Class D, Grade 1A, £1,235 × £30 to £1,325.

ASSISTANT ENGINEER (Efficiency), EARLEY GENERATING STATION READING (S/13.1021).

Applicants should have had considerable experience in the operation and testing of plant installed in a large modern generating station using pulverised fuel. Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional institution.

Salary N.J.B. Grade G.7, £935 × £20 to £995.

Special application forms for each post obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 20th August, 1958. 4399

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

RESEARCH AND EXPERIMENTAL MECHANICS

required for reactor maintenance work. Duties include the repair, servicing and calibration of a wide range of instruments and electronic units. There are also vacancies in the control circuiting and light electrical field.

Applicants should have served a recognised apprenticeship or have received equivalent training. Some industrial experience is essential.

Working conditions are excellent. There are facilities for technical training and prospects of promotion to technical posts.

Accommodation will be provided for the successful applicants who live beyond daily travelling distance. Married men will be eligible for a house and a lodging allowance will be payable whilst waiting for a house and living apart from family.

Write for further details and application forms to—

Industrial Recruitment Office

A.E.R.E., Harwell

Didcot, Berks

4389

ELECTRICIANS

required for interesting work in connection with instrumentation in a large chemical works.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham

4247

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

FOURTH ASSISTANT ENGINEER is required in the System Operation Department at Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 6, commencing in range £895-£1,020, ultimately rising to £1,140 per annum.

The duties are of a general technical and statistical nature and applicants should have had a sound technical training and practical experience, preferably in connection with system control. The possession of Higher National Certificate in Electrical Engineering or equivalent qualifications will be considered an advantage.

Apply, quoting Vacancy No. 845MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 21st August, 1958.

MAINTENANCE ENGINEER (Electrical) is required at Walsall and Birchills Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J6, £1,160-£1,235 per annum.

A sound technical training and practical experience in the maintenance of modern power station electrical plant is required, and the possession of appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 844MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 21st August, 1958. 4378

SALES AND CONTRACTS ENGINEERS

Meters, Relays and Instruments

ENGLISH ELECTRIC

Stafford

THE company wishes to appoint a number of young engineers having an interest in commercial engineering at the Stafford Works Relay or Instrument Sales Departments. As and when vacancies occur there will be opportunities for later transfer to the staff of the company's branch offices at home and abroad, providing a sales and technical advisory service to customers.

Applicants should have obtained or be in process of securing their H.N.C. (E.) or equivalent qualification.

Please write to Dept. C. P. S., Marconi House, The Strand, London, W.C.2, quoting reference ER.1212P.

4302

JOHNSON & JOHNSON (GT. BRITAIN) LTD.

Permacel Tapes Division

APPLICATIONS invited from men of personality and ability for the important appointment of TECHNICAL SALES ADVISER for the Electrical Trade. Applicants should have basic knowledge of electrical engineering with an accepted qualification as well as a thorough experience in selling. They should be aged between 30 and 45 years.

The successful candidate must be prepared to travel anywhere in the United Kingdom, as he will be required to call on works directors and arrange tests in factories in all parts of the country.

This is a rewarding post for a man of outstanding sales ability. It carries a high salary and generous expenses, and a car will be provided. Holiday arrangements will be respected.

Please send applications in confidence to Mr. W. Linton Thomson, Permacel Tapes Division, Johnson & Johnson (Gt. Britain) Ltd., Slough, Bucks. 4379

YORKSHIRE ELECTRICITY BOARD

No. 6 (Hull) Sub-Area

HULL DISTRICT

THIRD ASSISTANT DISTRICT ENGINEERS (2 posts).

Applicants should have had a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Preference will be given to applicants who are Graduate Members of the Institution of Electrical Engineers or possess equivalent qualifications.

Candidates must be prepared to reside in Hull and undertake standby duties.

Salary N.J.B. Class J, Grade 9, £935/£20/£995 per annum.

FOURTH ASSISTANT DISTRICT ENGINEER.

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications, and should have had experience in the construction and operation of H.V. and L.V. distribution networks, substations and plant in a city with industrial and commercial consumers.

The successful candidate will be required to reside in Hull and undertake standby duties.

Salary N.J.B. Class J, Grade 11, £835/£15/£880 per annum.

Applications, quoting 6 S.A.R., giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 21st August, 1958. 4411

TRANSFORMER DESIGN

'ENGLISH ELECTRIC'

STAFFORD

THERE are openings in the company's heavy transformer design group for designers to deal with power transformers, rectifier transformers, chokes and reactors.

Design experience in this field is essential for the more senior appointments, though we are also interested in younger engineers of degree standard or with their H.N.C. who have the necessary potential.

Please write giving full details to Personnel Services, Marconi House, 336/7, Strand, London, W.C.2, quoting Ref. ER.1202D.

4382

CENTRAL ELECTRICITY GENERATING BOARD

ASSISTANT ENGINEER
(Protective Gear Design and Application)

ASSISTANT Engineer required in the Transmission Design Branch, Transmission Department, at Headquarters, London, S.E.1. Candidates should have technical qualifications equivalent to A.M.I.E.E. standard, and a University Degree in Engineering would be an advantage. They should have had experience in the design, commissioning and maintenance of protective gear on generators, cables, overhead lines and transformers on H.V. systems, and should be familiar with protective gear and switchgear control diagram work.

Salary within scale £1,105-£1,315 p.a.

Application forms from I. G. Ellis, Personnel Officer, Central Electricity Generating Board, 24-30, Holborn, London, E.C.1, to be returned by 20th August. Envelopes should be marked "Confidential—Ref. ER/223." 4393

CENTRAL ELECTRICITY GENERATING BOARD

Research and Development Department

APPLICATIONS are invited for the post of DIRECTOR OF DEVELOPMENT PROJECTS (Electrical) in the Research and Development Department of the Central Electricity Generating Board at Headquarters, London, S.E.1. The successful candidate will be responsible to the Chief Research and Development Officer for the economic assessment, initiation and headquarters supervision of development projects in the fields of electrical equipment, transmission and system control undertaken both at out-stations and at the Board's Laboratories.

This is a senior appointment requiring wide experience of research or project direction in the fields of physics or electrical engineering. Previous experience in the heavy electrical supply or manufacturing industries would be an advantage but is not essential.

Candidates should have a good honours degree in science or engineering, or equivalent qualification.

Salary will be on a scale within the range of £2,960 to £3,860 p.a. according to the agreed duties and responsibilities of the post.

Letters of application stating age, qualifications and experience, present position and salary should be forwarded to S. S. Scott, Chief Personnel Officer, Buchanan House, 24-30, Holborn, London, E.C.1, by 8th September. Please mark envelopes "Confidential," Ref. ER/225. 4408

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Maintenance)

Oxford District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class J, Grade 9 (£935-£995 per annum). N.J.B. conditions of service.

The duties of the post will be to assist generally with the operation and maintenance of the 33 kV, 11 kV and L.V. overhead and underground distribution systems and substations. Standby duties are involved. A sound technical training and experience are necessary.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, in envelopes suitably endorsed, quoting Z.935, not later than 18th August, 1958.

Assistant Engineer (Planning)

Sub-Area Engineering Department of No. 1 (Southall) Sub-Area, located at Waterloo Road, Uxbridge. Salary N.J.B. Class L, Grade 13 (£885-£930 per annum, inclusive of London allowance). N.J.B. conditions of service.

The duties of the post will be to assist in the preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground H.V. and L.V. networks.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him in envelopes suitably endorsed, quoting Z.934, not later than 18th August, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) superannuation scheme, if eligible. 4404

CENTRAL ELECTRICITY GENERATING BOARD

Yorkshire Division

APPLICATIONS are invited for an appointment as FOURTH ASSISTANT ENGINEER in the Leeds Grid Control Centre of the System Operation Department, Becca Hall, Aberford, Nr. Leeds.

Commencing salary within the range £710-£835 per annum, Class AX, Grade 8, according to qualifications and experience, rising to an ultimate maximum of £935 per annum (Class EX), plus an additional 10% of basic salary for shift work.

The successful applicant will be required to undertake duties of a general technical and statistical nature. Candidates should possess a University Degree, Higher National Certificate or equivalent qualifications, and experience in a generating station is desirable.

Application forms obtainable from the Divisional Secretary (Establishments), Central Electricity House, St. Mary's Road, Leeds, 7, to be returned within 10 days of the appearance of this advertisement. 4378

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment :—

OPERATION SUPERINTENDENT, LITTLE BARFORD "A" & "B" GENERATING STATION.

Salary Class H, Grade 4, £1,235 × £30 to £1,325 per annum, rising to Class J, £1,325 × £30 to £1,415 per annum.

Applicants should have had considerable experience of the operation and administration of a large modern generating station, operating with pulverised fuel equipment.

The successful candidate will be responsible for the efficient operation of the generating plant, coaling, ash handling and disposal.

Membership of one of the senior professional engineering institutions, or equivalent qualification, will be an advantage.

Applicants who applied for S.V. No. 1047 (Reference No. 2/9398) need not re-apply.

Applications, quoting Reference No. 2/9488, stating age, qualifications, experience and present position should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, to arrive not later than 19th August, 1958.

W. N. C. CLINCH,
Controller. 4391

EAST MIDLANDS ELECTRICITY BOARD

Grantham District
Lincolnshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the position of Third Assistant District Engineer in the Mains Department of the Grantham District.

Candidates should have experience of both underground and overhead networks with voltages up to and including 11 kV and be capable of carrying through distribution schemes from the initial planning stage to final commissioning, including the negotiation of wayleaves.

The possession of the Higher National Certificate in Engineering or an equivalent qualification would be an advantage.

Ability to drive a motor vehicle is essential and the successful applicant will be required to reside in or near to the Borough of Grantham and to undertake standby duties.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Class E, Grade 8, namely £790 × £15 to £835.

Applications, giving details of age, education, qualifications, experience and position held, should be forwarded to the Sub-Area Manager, North House, Grantham, so as to reach him within fourteen days of the issue of this advertisement. 4401

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment :—

STATION CHEMIST, SOUTH DENES (GT. YARMOUTH) GENERATING STATION.

Salary Class H, Grade 6, £1,065 × £1,140 per annum.

Applicants should be qualified chemists, at least Higher National Certificate (Chemistry), or equivalent, and be experienced in the chemical control of plant and materials in a modern generating station.

Knowledge of associated chemical, metallurgical and biological problems and their treatment is necessary, and experience with ion-exchange plant and oil-fired boilers would be an advantage.

Applications, quoting Reference No. 2/9490, stating age, qualifications, experience and present position should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, to arrive not later than 19th August, 1958.

W. N. C. CLINCH,
Controller. 4392

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS are invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

STATION SHIFT CONTROL ENGINEER, BLACKWALL POINT POWER STATION
(Vacancy No. 58/590).

Sound technical training necessary with experience in control and operation of modern generating plant and E.H.T. switchgear. Salary Class F, Grade 10 = £780 plus £74 shift p.a.

ASSISTANT ENGINEER (Operation), HACKNEY POWER STATION
(Vacancy No. 58/591).

Sound practical training with experience in efficient operation of modern power station plant. Will be required to act as relief for any N.J.B. shift staff on station. Salary Class H, Grade 9 = £935 plus £88 10s. shift p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 18th August, 1958. 4390

COUNTY BOROUGH OF GRIMSBY

Education Committee

College of Further Education

Principal: E. S. Green, B.Sc., A.R.I.C.

APPLICATIONS are invited for the post of ASSISTANT GRADE B to teach Electrical or Mechanical Engineering. Applicants should possess a Higher National Certificate or degree qualification and suitable teaching or industrial experience is desirable.

Salary in accordance with the Burnham Scale for Teachers in Technical Institutions (£650 × £25 to £1,025, with certain additions for degree and training where appropriate). Increments on the scale will be granted for approved industrial experience.

Further information and application forms may be obtained from the undersigned, and applications should be returned within fourteen days of the appearance of this advertisement. (s.a.e.)

R. E. RICHARDSON,
Director of Education.

Education Office,
Eleanor Street, Grimsby.
28th July, 1958. 4364

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule B. Salary includes London allowance.

CHEMICAL ASSISTANT, WEST HAM POWER STATION
(Vacancy No. 58/592).

Should preferably have advanced G.C.E. and an interest in investigational work in laboratory and on power station plant. Salary £315 (age 18) to £580 (age 22).

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 18th August, 1958. 4410

THE ELECTRICITY COUNCIL

Assistant to the Regional Safety Officer

THE Electricity Council require an ASSISTANT to the Regional Safety Officer, London Region. Candidates should have good engineering qualifications, a knowledge of the Factories Acts and Safety Regulations, and preferably some experience in accident prevention in the electricity supply industry. Salary within N.J.B. Grade 4 £1,210-£1,570 p.a. inclusive.

Applications stating age, salary and giving full details of qualifications and experience, to E. Landucci, Winsley Street, London, W.1, to arrive not later than 22nd August, 1958. Quote Ref. C/19. 4407

EAST MIDLANDS ELECTRICITY BOARD

Northamptonshire Sub-Area

THIRD ASSISTANT ENGINEER
Substation Construction

APPLICATIONS are invited for the above appointment at the Sub-Area Headquarters, Northampton.

Candidates should possess technical qualifications equivalent at least to the Higher National Certificate in Electrical Engineering and should have experience of both overhead and underground systems up to and including 33 kV; particularly in the construction and equipment of substations, preferably including protective gear and control schemes for switchgear, transformers and associated equipment.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class K, Grade 10 (£935-£995 per annum).

Applications, stating age, education, qualifications, experience, present position and salary, should be forwarded to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, so as to reach him within fourteen days of the issue of this advertisement. 4402

COLLIERY ELECTRICIAN

required by

NIGERIAN COAL CORPORATION

on contract for three tours each of 18/24 months. Salary scale (including inducement allowance) £1,014, rising to £1,410 a year.

Commencing salary of £1,140/£1284 for suitable candidate. Provident fund to which Corporation's contribution is at the rate of £223/£310 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages and grant up to £150 annually towards maintenance in U.K. Liberal leave on full salary.

Candidates should have served an appropriate apprenticeship and have had subsequent experience in the installation, operation, and maintenance of electrical plant in a U.K. colliery. They should be experienced in all branches of colliery electrical work including H.T. and L.T. systems, electrically operated coalcutters, conveyors, drilling equipment, and pumping and haulage plant. Certificate of the Association of Mining Electrical Engineers an advantage.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/50181/EF. 4406

SOUTH WESTERN ELECTRICITY BOARD

Central Cornwall District

DISTRICT COMMERCIAL ENGINEER

APPLICATIONS are invited from suitably qualified and experienced persons for the above appointment.

Salary according to Class E, Grade 4, £995 × £20 to £1,055 per annum of the N.J.B. Agreement.

The successful candidate will be responsible to the District Manager, Central Cornwall, for the organisation and control of all commercial activities in the district including negotiations for supplies and tariffs, supervision of street lighting negotiations and conducting sales and publicity campaigns.

Experience in such duties and possession of the Higher National Certificate in Electrical Engineering is desirable.

Applications to be made on official form obtainable by POSTCARD ONLY from District Manager, South Western Electricity Board, 6, Grove Place, Falmouth, Cornwall. Closing date for receipt of completed applications is 23rd August, 1958. 4403

ELECTRICAL RESEARCH ASSOCIATION

require urgently ENGINEER OR PHYSICIST for research on high-power fuses and allied control gear. Considerable scope for advancement for candidate with initiative and ability. Degree preferred. Salary according to qualifications and experience.

Apply :—

5, Wadsworth Road,
Perivale, Greenford, Middlesex

4381

EASTERN ELECTRICITY BOARD

Essex Sub-Area

THIRD ASSISTANT ENGINEERS
(a) Chelmsford (78/58.R) and
(b) Thurrock Districts (79/58.R).

CANDIDATES should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class F, Grade 9 (£790-£835) (Thurrock District, plus London allowance).

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply by letter, within 14 days, to :—

(a) D. H. Walker, A.M.I.E.E., Manager, Eastern Electricity Board, Anchor Street, Chelmsford, Essex.

(b) H. J. Unwin, A.M.I.E.E., Manager, Eastern Electricity Board, Maidstone Road, Grays, Essex. 4397

EASTERN ELECTRICITY BOARD

Chilterns Sub-Area

SUB-AREA COMMERCIAL OFFICER (80/58.R)

THE candidate appointed will be required to deal with the organisation of commercial activities in this Sub-Area, which is an urban and rural Sub-Area with a large industrial content, including negotiation of tariffs with large industrial consumers, sale of electricity, general commercial development, control of installation contracting and general maintenance of public contracts, including street lighting.

Salary in accordance with Grade 5, Class D (£2,100-£2,300) of the National Joint Managerial and Higher Executive Grades Agreement.

Apply by letter to the Manager Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, by 22nd August, 1958. 4398

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

TWO ASSISTANT CONSUMERS' ENGINEERS required in the Conway Valley District. Salary within range £540/£585 per annum (N.J.B. E/13).

Applicants must have completed a recognised apprenticeship and had engineering training. Technical qualifications are desirable.

The duties of the posts will include estimating and preparation of specifications for contracting work and the supervision of such work, advising consumers on matters relating to electricity supply and the utilisation of electricity and equipment.

Appointments subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date 14th August, 1958. 4376

PIPE FITTERS

required for interesting work with prospects of training to become instrument fitters at a later date.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham
4248

MIDDLESEX COUNTY COUNCIL

Education Committee

LABORATORY STEWARD (Misc. V) required in Electrical Engineering Laboratories at Hendon Technical College, The Burroughs, Hendon, London, N.W.4. Ability to maintain and manufacture electronic and radio equipment essential. Salary £655 rising to £715, if 26 years or over. Prescribed conditions.

Application forms from Principal, returnable immediately (Quote X 983 ER). Canvassing disqualifies. 4412

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

SHIFT CONTROL ENGINEER required at Newton Abbot Power Station.

Superannuation scheme. Salary N.J.B. Class F, Grade 10, £740-£785 plus 10% shift allowance.

SHIFT CONTROL ENGINEER required at Feeder Road Power Station, Bristol.

Superannuation scheme. Salary N.J.B. Class E, Grade 10, £685-£730 plus 10% shift allowance.

Candidates should possess good technical qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 20th August, 1958. 4405

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

A TECHNICAL EDITOR

is required in the Publicity Department at Trafford Park, Manchester. He should be interested in the clear and concise presentation of technical information. An ideal background would be a combination of engineering and writing.

The successful applicant will join the section responsible for the company's technical and commercial publications, which range from power station plant to scientific apparatus, and will work in close co-operation with the technical and commercial staff concerned.

Write giving details of age, education, training, experience, present position and salary to the Manager, Publicity Department, Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester, 17. 4361

REPRESENTATIVES

with experience of selling electric cookers and fires required for the following areas :—

(a) London.
(b) Southern Counties.
(c) Merseyside and N. Wales.

Applicants should be not over 35, resident in the area, and possess a car.

A sound connection with the Area Electricity Boards, electrical wholesalers and retailers is essential.

Write giving age and details of education, qualifications and experience, to :—

BELLING & CO. LTD.
Bridge Works, Enfield, Middlesex
4326

A.E.R.E., HARWELL

7 GeV Proton Synchrotron

A PROFESSIONAL ENGINEER (A.M.I.E.E. normal minimum) with relevant experience is required to be responsible for the maintenance and operation of all electrical plant and equipment associated with the project, including two 60 MVA motor alternator sets feeding about 30/sec. D.C. pulses to a 7,000 ton electro-magnet. There will be a 15 MeV linear accelerator supplied by R.F. power at about 115 Mc/sec. and a control room with extensive monitoring facilities.

SALARY £1,790-£2,080.

Send POST CARD to the Group Recruitment Officer (1180/48), U.K.A.E.A., Atomic Energy Research Establishment, Didcot, Berks for details and application form. 4409

WOOLWICH POLYTECHNIC
London, S.E.18

APPLICATIONS invited for SENIOR LECTURER in Electrical Engineering; should have high academic qualifications and industrial experience and an interest in power and machines; opportunities for research.

Salary scale £1,350-£50-£1,550, plus London allowance of £36 to £48.

Particulars and application form from Clerk to Governors, to be returned by 27th September. 4403

ACCOUNTS clerk required by electrical contractors, London, S.W.1. Preferably with knowledge of trade and some book-keeping experience. Good opportunity for keen young man. Write giving experience and salary required.—Box 4229.

A POSITION with unusually good prospects occurs in the London office of West Country firm manufacturing small electrical components. Design experience in this class of product with knowledge of relative B.S.I. requirements, and experience of light assembly and press tool design essential. Knowledge of plastic moulding an advantage. Applicants should hold H.N.C. (Elec. or Mech. Eng.) or equivalent. Fullest details please, to—Box 4418.

CONSULTING engineers, London, wish to interview Corporate Members of the I.E.E. between the ages of 28 and 40 who are experienced in the design and supervision of installations for the electrical equipment of commercial and industrial buildings. The selected candidate, who must be of good manner and appearance, will be offered the post of salaried partner with a remuneration between £1,100 and £1,300 per annum depending on experience. Prospects of full partnership. Please write giving full details to—Box 4369.

CONTRACTS engineer required to promote sales of time switches, particularly in their application to new industrial developments. Applicant must have thorough knowledge of time switches and be able to write specifications of proposed new designs. Write giving particulars of experience and salary required.—Contracts Manager, Meters & Time Switches Division, Sangamo Weston Ltd., Great Cambridge Road, Enfield, Middlesex. 4375

CONTROL gear engineer required, age 23-35, for layout and circuiting of contactor equipment. Good salary. Permanent and progressive position. Canteen, pension scheme. Write stating age, experience and qualifications, if any, to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 273

EKCO-ENSIGN ELECTRIC Ltd. require experienced lighting engineer at their Birmingham office. He should be thoroughly conversant with modern lighting practice and equipment. Apply—Senior Lighting Engineer, 45, Essex Street, Strand, London, W.C.2. 388

ELECTRICAL draughtsman for switchboard layouts, etc. Permanent position. Salary by agreement. Please write—Chief Draughtsman, Astral Switchgear Ltd., Alma Rd., Enfield, Middx. 4385

ELECTRICAL engineer required for interesting and varied work on preparation of tenders for switch and control boards, etc., from limited basic information. Plenty of scope for ingenuity and originality of approach on both commercial and technical aspects. Small composite works London area. Full details and salary, please, to—Box 4303.

ELECTRICAL engineers and contractors require engineer experienced construction steel tower and wood pole overhead lines. Excellent prospects. Pension scheme. Write age and experience.—Box 4316.

ELECTRICAL firm with attractive retail showrooms and small contracting business of good standing requires capable electrician with high standards of service ; able to drive. N.W. London. Good prospects for keen man prepared to train for responsible position. State age and full details of career.—Box 9440.

ELECTRICIAN required for testing hospital equipment and general maintenance. Good general experience essential. Basic rate £11 9s. 2d., 44-hr. wk. Permanent pensionable post. Applications in writing to—Chief Engineer, Hammersmith Hospital, Du Cane Road, London, W.12. 4373

ENGINEERS for overhead and underground distribution schemes required by electrical engineers and contractors. Excellent prospects. Pension scheme. Give age and experience.—Box 4317.

ESTIMATOR required for N.W. London firm of contractors ; experienced in industrial and council installations. Apply giving age, salary required and details of experience.—Box 4374.

EXPERIENCED floor inspector required for winding department. Must be fully conversant with winding techniques of all types of small electric motors. Modern works 30 miles south of London.—Box 4367.

***Situations Vacant** (continued)*

ENGINEERING organisation offers an engineer an opportunity in their sales department. The duties will be in connection with electrical equipment for the machine tool industry and will entail advice to customers, preparing of quotations, processing of orders and servicing. Knowledge of the design of machine tools would be required. Applications to—Box 4320.

FULLER ELECTRIC Ltd., require junior technical engineers for their transformer sales department. Knowledge of power transformer manufacture and some commercial experience necessary. Applications stating technical qualifications and experience, to—Personnel Officer, Fulbourne Road, Walthamstow, London, E.17. 4417

JUNIOR engineer required for work in sales office concerned with preparation of tenders for switch and control boards in small manufacturing unit. Constructive and interesting work which would suit a young man wishing to extend his experience. — Astral Switchgear Ltd., Alma Road, Enfield, Middx. 4371

KEEN young draughtsman with machine shop training required for small production drawing office of company engaged in the manufacture of control gear equipment. Electro-mechanical experience desirable but not essential. Permanent and progressive position. 5-day week, pension scheme, canteen, etc. Apply giving full details of age and previous experience to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middx. 278

KENWOOD MANUFACTURING Co. Ltd. invite applications from salesmen of high calibre to fill newly created positions in expanding sales force. Experience in the electrical trade is essential and men with specialised knowledge of Electricity Boards' contact and sales will have some advantage. The positions are permanent and progressive and entail top level contact with the above and the supervision of well-established and important territories. Generous salary, expenses, pension scheme. Full training given. Write in strict confidence to—Personnel Manager, Kenwood Manufacturing Co. Ltd., Hipley Street, Old Woking, Surrey. 4366

MANUFACTURERS underfloor duct systems for electrical services require sales representative calling upon architects, consultants, contractors in London. Applicants between 25 - 35, good education, appearance. Duties include preparation schemes and quotations. Initial training in sales office. Write with qualifications—Greenwood Airvac Conduits Ltd., Carlisle House, 8, Southampton Row, London, W.C.2. 4368

MUNICIPAL MUTUAL INSURANCE Limited has a vacancy for a lift surveyor in London. Post is permanent and pensionable to satisfactory candidate who should have served an apprenticeship and have sound practical and theoretical knowledge of lifts. Technical qualifications, Higher National Certificate. Salary £735-£1,060 per annum. Apply in own handwriting, marking envelope "Application Lift Surveyor," and "Private and Confidential," to Chief Engineer, Old Queen Street, Westminster, London, S.W.1. 4372

ROYAL NAVAL SCIENTIFIC SERVICE requires senior scientific officers and scientific officers for establishments in London area, Baldock, Portsmouth, Portland, Poole, Greenock and Rosyth. Main requirements are about 25 vacancies for physicists, electronic engineers and mathematicians in areas specified. The following particular vacancies also exist : mechanical engineer for work on gas turbine problems in the London area ; mechanical engineer for work on design and development of u/w devices in Portland area ; metallurgists for Rosyth and Poole ; chemists (physical and inorganic) for Poole area, Baldock and London. Candidates must normally be natural-born British subjects of natural-born British parents, with at least first or second class honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be not less than 26 years of age. Salaries (men): S.S.O. £1,190-£1,410 ; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between the ages of 21 and 32 to compete for established posts. Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A98/8A. 4257

SALES order clerk required. Senior post, well paid position offering scope in the future. Superannuation scheme, canteen and social club facilities. Experience of electrical wholesaling essential. Apply to—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 4263

SALES promotion and publicity. Splendid opportunity exists with Higgs Motors Ltd., Witton, Birmingham, for ambitious and enthusiastic young man about 35 years old or younger. Must have knowledge of electric motors and a keen interest in publicity work. Apply giving age, qualifications and salary required. 4383

STOREKEEPER required, must be experienced and fully conversant with electrical wholesale trade. Good wages and conditions, superannuation scheme, canteen and social club facilities. Apply to—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 4264

SWITCHGEAR and motor control gear manufacturer in the N. East requires capable designer engineer in L.V. range. Good opportunities for right man, state qualifications, experience and salary in confidence, to—Box 4419.

TECHNICAL assistant with sound knowledge in general electrical engineering, qualified at least to H.N.C. standard, required as technical sales engineer by agents for well-known Continental electrical engineering organisation. The work is of wide range and interesting. Applicants preferably should have knowledge of German but this is not essential, and they should be between 25 and 40 years of age. Write with full details of education and experience to—Box 4319.

TECHNICAL sales engineer with good electrical and mechanical training and experience in industrial and machine tool automatic control gear applications required by progressive Birmingham company. Applicants are asked to submit in complete confidence details of age, education, technical training and previous posts to Personnel Manager.—Box 4384.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A.M.I.E.E., 46, executive experience all aspects sales, contracts, design, development, liaison, publicity in switchgear, motor control, cables, overhead lines, etc., seeks responsible senior position.—Box 9430.

ELECTRICAL engineer seeks appointment with reputable co. as supervisor. Pref. outside industrial contracting.—Box 9442.

GENERAL clerk, invoicing, costing, ordering materials, assist estimating and supervising, able to take charge, London/Essex area.—Box 9439.

ARTICLES FOR SALE

METERS

Scrap Tender No. 81/26/8

THE NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD (Aberdeen Area) has for disposal 259 5 amp. single-phase meters and 6 D.C. rotating sub-standard meters with shunts and shunt leads.

Tender forms and conditions of acceptance may be obtained from the undersigned with whom offers should be lodged not later than Tuesday, 26th August, 1958.

J. E. WHITTAKER,
Area Manager.
Millburn Street,
Aberdeen. 4415

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., 1/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

MOTORS

Commutator Type Variable Speed A.C. Motors, Moving Brush Type, 3/50/400-440 volts

H.P.	Revs.	Maker.
90/30	680/227	B.T.H.
45/4.5	2400/250	B.T.H.
30/5	720/120	A.S.E.A.
30/6	1500/300	B.T.H.
20/10	1400/700	B.T.H.
16/1.35	1600/160	HOLMES REYROLLE
5	1200/600	METRO-VICK

THOMAS MITCHELL & SONS LTD.
Bolton

4305

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220v. D.C. to 230/1/50 A.C., 125 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London,, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale, cheap, 23, 25, 27 sg. D.C.C. copper wire. 8-way Jones plugs and sockets. Varnish impregnation plant. H.T. rectifier set, input 400/1/50, output variable D.C. 0 to 40,000 volts at 375 mA.—1, Beaufort St., Manchester, 3 (BLA. 4571). 9433

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc.—Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW, A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

L.D.C. 14-h.p. slipring motor, 415 volts, 3-phase, 1,435 r.p.m. Complete with wall mounting starter. £70 or near offer.—Adco Limited, Rickmansworth, Herts. 4386

MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

MOTOR generator sets and converters, all sizes and voltages from ½kW up to 500kW Co. Ltd., Bow St., Keighley (3774-5-6). 70 in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit breakers. Huge stocks of all types, ½ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons, Ltd., 153, Far Gosford Street, Coventry. 108

OFFERS invited for the following diesel alternator sets: 2 425-h.p. 6-cylinder Deutz diesel engines. 425 r.p.m. direct coupled to 355 kVA A.S.E.A. alternators. Supply 415 v., 3-p., 50 c., with switchgear, panels, air compressor, oil storage and service tanks. 1 200-h.p. 4-cylinder Deutz diesel engine. 300 r.p.m. direct coupled to 165 kVA A.S.E.A. alternator, supply 415 v., 3-p., 50 c., with switchgear, panels, air compressor, oil and service tanks. Can be viewed at the following address.—The Poppe Rubber & Tyre Company Ltd., Sherland Road, Twickenham, Middx. 9443

PHASE converters, single to three-phase several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switchholder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

SLYDLOK fuses for sale.—Ryness Supplies, 37, Goodge Street, London, W.1. 284

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TRANSFORMERS, oil cooled, 3-phase, 2,000 kVA, 11 kV/3.3 kV, outdoor 41 DY 11, price £675. 300 kVA, 11 kV/440/230. Rectifier, glass bulb, 300 kW, 11 kV/3.3 kV, output 500 v. D.C.—Sanger, 89 Weoley Park Road, Birmingham, 29 (Tel. SEL. 2056). 9435

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps, from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

YATTENDON ESTATES Ltd. have to offer: (1) Brook motor from circular rack saw bench with 60-h.p. slipring, 1,450 r.p.m., 450 v.; (2) English Electric motor from Robinson plain circular saw bench with 12½ h.p., 400/44 v., 3-ph., 1,435 r.p.m. Inspection by appointment at the Estate Office, Yattendon, near Newbury (Tel. Yattendon 255). 4387

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service.—Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return.—Whitetrade Limited, Rochester, Kent (Tel. Chatham 41133, 3 lines). 294

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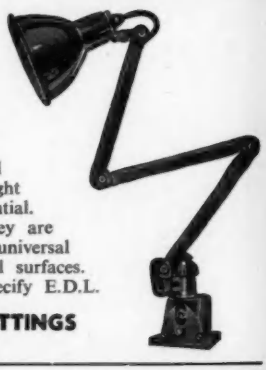

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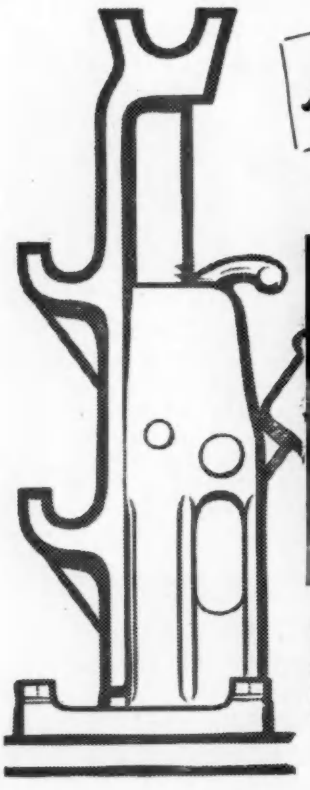

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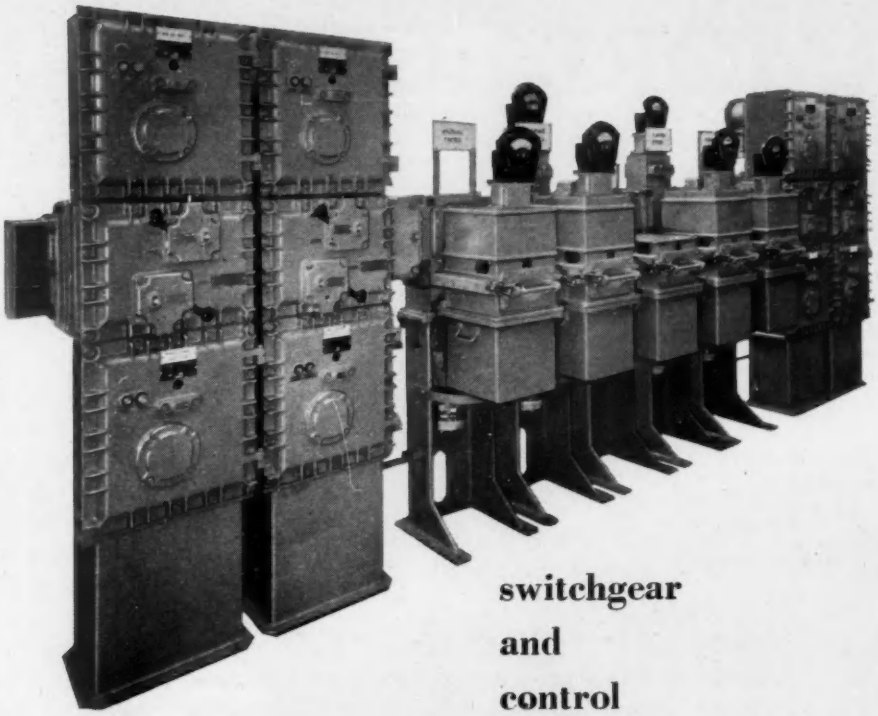

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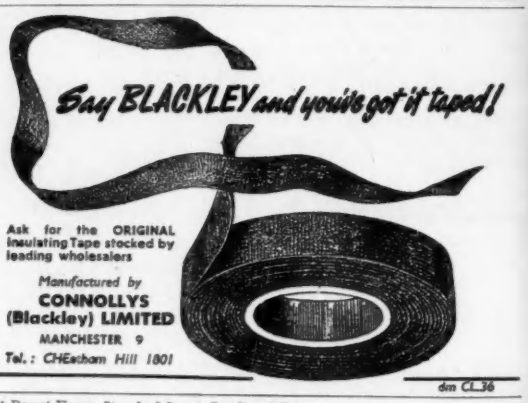

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